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NATURE-PRINTED BUTTERFLIES.

BY JAMES FLETCHER, OTTAWA, ONT.

The season of warm days, flowers and butterflies is over now, and the look-out is cold, bleak and bare. Apparently there is little for the scientific lover of nature to do in the way of collections at this time of year; such, however, is far from being actually the case, as all who have collected will testify. It is, in fact, one of the busiest seasons for collectors; all the treasures gathered during the summer months have to be *gone through*. In the first place, those known have to be taken out and sorted away into their proper places in the cabinet; the remainder then have to be re-sorted and divided up into sets according to the families to which they appear to belong, and after this they have to be examined critically, and, if possible, identified. It frequently happens that a collector of butterflies has an opportunity of capturing a large number of some local species in one day, and finds it impossible or irksome to set them all before they become too dry, as they will in a very short time in hot weather. When they are once dry, too, one is apt to think that as they can get no worse, they may safely be put aside until some more convenient occasion, to be relaxed and set up; but this convenient occasion, like a good many others, is sometimes very long coming and many valuable specimens are consequently thus lost.

An accident which occurred to the glass of one of the drawers of my butterfly cabinet lately, was the means of reminding me of a process shown me some years ago by a Captain Lloyd, of the English Navy. The accident referred to was the breaking of the cover of one of my cases which contained some rare butterflies, in consequence of which it was impossible to close the door of the cabinet tightly. My horror can be better imagined than expressed when, upon opening the door and pulling out this drawer, about a fortnight afterwards, I found that there was not a single perfect specimen in it; a mouse had got in, and what was once a

neatly arranged case of butterflies was now nothing but a chaos of nibbled bodies, loose wings, pins and labels. I had not the heart at first to throw out these fragments, and so wipe out entirely the pleasing recollections each brought up in my mind of rambles through the woods and in the country, so carefully gathering up the wings I put them away in a little box. The idea then struck me of printing them as I had seen my old friend do them, and as I think it would be a very convenient way for Entomologists and Agriculturists to send butterflies for identification, when spare duplicates are to be had, I am induced to send a description of the *modus operandi*:

Take the insect in your left hand, holding it beneath the thorax; then with a pair of sharply-pointed scissors cut off the wings as close to the body as possible. Occasionally, unless the scissors are very sharp, some of the muscles are torn away from the thorax with the wings; these must be carefully removed. Arrange the wings in pairs and put them with the body on one side, in some convenient place where they may be easily got at when you are ready for them. Now take a piece of white paper of the size required, and fold it in two like a sheet of note-paper; then with a camel-hair brush lay on a thin wash of perfectly clear gum-arabic, fold down the upper half and pass the hand lightly over it so as to spread the gum evenly between the two sides; now re-open it, and taking up the wings with the tip of the brush, the lower ones first, arrange them carefully in the position wanted, leaving space enough intervening between the two pairs to paint in the body afterwards. Spare no pains in arranging the wings; this corresponds with "setting" for a cabinet. I have seen many good collections of insects, made by amateurs, rendered almost useless by the want of a little thought on this point. The proper position for a butterfly to be set in is that which it takes when sunning itself. Copy nature and you cannot go wrong. When the wings are quite even, gently fold down the upper half of the paper and put your specimen under a heavy weight, or in a press, until quite dry. I generally leave mine for some hours at least. When it is quite dry take it out and place it against a window pane so that the butterfly may be clearly defined against the light. Now very carefully draw a line with a black lead pencil round the edges of the wings; then lay it down on an even surface and paint with clean water all over the part outside and up to the outline. After a few minutes the water will saturate the paper and dissolve the gum; the two sides will then separate easily, and this being done, it will be found that

on one side is a perfect representation of the upper side of the butterfly, on the opposite another of the under side, and loose between these a perfectly clear horny membrane ; the explanation of this is, the upper ends of the scales are adhering to the gum and what we now look at are the lower ends or roots. When painting with water, to dissolve the gum, great care must be taken not to let it run over the outline on to the wings, or else the scales will not adhere to the paper, but will remain on the membrane.

The work is not yet finished, however ; a most important part has still to be done. This is the filling in of the body and antennæ ; the easiest way to do this is with a fine pen and some water-colors. Place the body from which the wings were severed before you and copy it, taking particular notice of any characteristic markings, as, for instance, the color of the eyes, legs, or antennæ. When finished cut it out with a pair of sharp scissors, paste it in an album, and write a short description of its capture, giving the date, locality and any other interesting circumstances connected with it. I have found it is easier to put in the antennæ after the prints are gummed into the collection, as on account of their fragility they are difficult to cut out neatly. Should the collector happen to be an artist, a most beautiful collection may be made in this manner by painting pretty designs with flowers for each species and gumming the butterflies in in natural positions ; of course, too, its scientific value will be materially increased if those plants are introduced to which the insect is most partial, and, when possible, a sketch of the larva and pupa is added.

The chief advantages of this process are : the ease with which it is done ; the great convenience with which the specimens are preserved or transmitted through the post for identification or exchange ; their greater durability, for they will stand much rougher handling than specimens preserved in the ordinary way ; and, more important than all these, the fact that if you have only one specimen you can show both the upper and under sides at once, and also the membranous skeleton of the wings, which can thus be very easily examined and makes a beautiful object for the microscope ; moreover, if you have only an imperfect specimen, it is possible to preserve a good likeness of it by filling in the wanting parts with water-colors. Further, it does not matter how old your specimens are ; I have some prints which I have taken from butterflies collected in India more than twenty years ago, which are quite as good as others printed on the same day that the insects were caught here.

ENTOMOLOGY FOR BEGINNERS—No. 2.

BY THE EDITOR.

CATOCALA ULTRONIA.

In the genus Catocala is included a number of very beautiful moths, many of them of large size, and restricted in their distribution to the northern portions of America. Most of them have the hind wings red, banded with black, and hence have received the common appellation of "Red under-wings." Some few species, however, have the red ground replaced by white, or by plain black, or dark brown edged with white, but

Fig. 1.

these latter are greatly in the minority and much less frequently met with than those with red hind wings. The fore wings are usually of varying shades of rich gray or brown.

In *Catocala ultronia* (fig. 1) the fore wings are of a rich umber color, darkest along the hind margin, with a broad diffused ash-colored band along the middle, not extending to the apex, which is brown; there are also several zigzag lines of brown and white crossing these wings. The hind wings are deep red with a wide black band along the outer margin and a narrower band of the same color across the middle. The ciliæ which border the wings are partly white and partly brown.

The larva feeds on the leaves of wild plum and is also found attacking the cultivated varieties. When full grown, which is about the 20th of June, it is nearly two inches long, a leech-like creature with its body thickest in the middle and tapering towards each end. When at rest it adheres so closely to the bark of the branch and so nearly resembles it in color, that it is difficult to detect. The body is of a dull grayish-brown studded with brownish dots and rows of dull reddish tubercles. On the top of the ninth segment or ring there is a stout fleshy horn, nearly upright, about one-twelfth of an inch long, pointed and similar in color to the

body, but with an irregular grayish patch at each side. On the twelfth segment there is a low fleshy ridge margined behind with deep reddish brown and an oblique stripe of the same color extends forward nearly to the spiracle on this segment. The terminal segment is flattened and has a number of small pale reddish and blackish tubercles scattered over its surface. Along the sides of the body close to the under surface there is a thick fringe of short fleshy-looking hairs of a delicate pink color.

The under surface is also of a delicate pink, of a deeper shade along the middle, becoming bluish towards the margins with a central row of nearly round black spots which are largest from the seventh to the eleventh segments inclusive. The anterior segments are greenish-white tinted with rosy pink along the middle, with a dull reddish spot at the base behind each pair of feet.

When about to change to a chrysalis the larva makes a rough enclosure by drawing together fragments of leaves and fastening them with silken threads, within which it undergoes its transformation and appears as a moth in about three weeks afterwards.

The moth is on the wing during the greater part of July and August, is attracted by light and comes freely to sugar. All the insects of this family are night-flyers and expose their brilliant hind wings only in flight. When at rest the gray or dull brown upper wings overlap and cover up the gaily tinted under wings like a very flat roof.

The American Currant Borer (*Psenocerus supernotatus*).

The accompanying cut (fig. 2) represents an enlarged view of a native currant borer, *Psenocerus supernotatus;* the small outline figure shows the natural size. It is a beetle belonging to the family of longicorns, *Cerambycidæ*, which doubtless had its home originally among the wild currant bushes of our woods, but a more extended and inviting field having been opened for it by the planting of the cultivated varieties in our gardens, it has taken kindly to them, and although not so destructive as the imported currant borer, *Egeria tipuliformis* (fig. 3), has in many instances proved quite troublesome. In nearly all our gardens numbers of the currant stalks annually perish, and were it not for the vigorous growth of new shoots from year to year, the bushes would soon be destroyed. If one

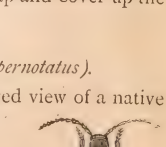

Fig. 2.

Fig. 3.

of these stalks is split asunder the cause of its death is manifest, for through its whole length it is found to be more or less eaten away, the hollows being filled in places by a fine sawdust-like powder. This is sometimes the work of the imported currant borer (fig. 3), and sometimes that of the native species (fig. 2).

Early in June the parent beetle of the native currant borer deposits her eggs upon the currant stalks, where they soon hatch into tiny grubs which burrow into the heart of the stem, and feeding on its pith, reach full growth before the close of the season. They are footless grubs, which measure when full grown about half an inch in length. The head is scarcely half as broad as the body, is of a dark brown color, with black jaws. The body is whitish with some brown dots along each side, and is slightly clothed with very fine short hairs. When full grown and about to change to a chrysalis, the larva gnaws a channel through the woody fibre to the outer bark, so that when changed to a beetle it can make its escape by merely rupturing the bark. The cavity thus made is filled with little chips to prevent the bark from being prematurely broken, and below this stuffing the insect constructs a bed of short woody fibres, packing the passage below with a finer material resembling sawdust. Within this enclosure, which is about half an inch in length, the larva changes to a chrysalis and reposes until the fully formed beetle is ready to emerge; then gradually drawing away the obstacles to its egress, it finds its way to the end of the passage, and gnawing a small round hole through the bark, effects its escape.

The beetle is black with the edges of the wing covers and the thorax pale chestnut brown. On each wing cover there is a rather large white spot beyond the middle, and two smaller anterior spots, which are sometimes ash-gray and sometimes yellowish. The antennæ, which are shorter than the body, are pale brown thickly clothed with short ash-gray hairs. The under side is black and sparsely covered with short gray hairs.

Dr. Fitch describes two parasites which he found attacking this pest in the larval state, one a small ichneumon fly, the other that of a small two-winged fly. Hence, secluded as it seems to be within the centre of the currant stem, it is unable to escape the acute instincts of its enemies, who searching it out, feed on its body and cause its death.

As these worms remain in the dead stalks throughout the winter, their destruction is easily compassed by breaking off all the dead wood to the surface of the ground and burning it.

LIST OF DIURNAL LEPIDOPTERA TAKEN IN THE VICINITY OF PORTLAND, MAINE.

BY H. H. LYMAN, MONTREAL, P. Q.

From 1868 till 1876 I spent from six to eight weeks of the summer on Cape Elizabeth, near Portland, Me., the visits extending from July 14th or 16th to Sept. 5th or 8th, and the following list of Diurnal Lepidoptera is compiled from my diaries:

1. Papilio asterias F. Formerly somewhat common, latterly very scarce; July and August.

2. Papilio turnus L. One specimen of the larva was found nearly full grown on Aug. 3, 1873.

3. Pieris oleracea Bd. Very scarce; July and August.

4. Pieris rapæ L. Generally very common all summer; quite scarce in 1874.

Var. nov. angliæ Scud. Scarce; none taken till 1875.

5. Colias philodice Godt. Very common all summer; white females not common.

6. Danais archippus F. Generally common, latterly rather scarce; August to September.

7. Argynnis idalia Cram. Some years scarce, sometimes somewhat plentiful; middle of July to beginning of September.

8. Argynnis cybele F. Somewhat common; July and August.

9. " aphrodite F. Common; July and August.

10. " atlantis Edw. Rather common; July to middle of Aug.

11. " myrina Cram. Very common; one brood in July and another towards the end of August and first of September.

12. Argynnis bellona F. Common; occurs at the same times as the last species.

13. Phyciodes Harrisii Scud. Not uncommon; July.

14. " nycteis Doub. Rare; July.

15. " tharos Drury. Very common; July.

16. Grapta interrogationis F. Rare; August to September; the three specimens which I saw belonged to the var. umbrosa Lint.

17. Grapta comma, var. Harrisii R. Rare; one specimen taken 9th September, 1876.

18. Grapta faunus Edw. Rare; latter half of August.

19. Grapta progne Cram. Common ; July and first half of August and sometimes early in September.

20. Vanessa antiopa L. Common ; July and August.

21. " Milberti Godt. Very scarce, though formerly more common ; August.

22. Vanessa J-album Bd. Not common ; from towards end of August into September.

23. Pyrameis atalanta L. Generally scarce, being preyed upon by four or five distinct species of parasites ; August.

24. Pyrameis huntera Drury. Not common ; August and September.

25. " cardui L. Formerly common, latterly very scarce ; August and September.

26. Junonia lavinia Cram. Very rare ; one specimen, the only one seen, taken August 11, 1876.

27. Limenitis proserpina Edw. Occasional, July ; sometimes there is a second brood towards the end of Augnst and beginning of September, as in 1874.

28. Limenitis arthemis Drury. Not abundant ; July and beginning of August.

29. Limenitis disippus Godt. Common ; end of July to September.

30. Neonympha eurytris F. Two worn specimens taken July 17, '73.

31. " canthus L. Somewhat abundant ; July.

32. Satyrus alope F. Common ; August.

33. " nephele ? Kirby. Not so common as last ; August. I have taken almost every variety between these two forms.

34. Thecla humuli Harris. Very rare ; July.

35. " mopsus Hübn. Not common ; July and August.

36. Chrysophanus epixanthe Bd.-Lec. Generally very rare, obtainable some seasons, as in 1869 and 1875 ; latter part of July and first half of August.

37. Chrysophanus Americana D'Urban. Very common ; August.

38. Lycæna neglecta Edwards. Rare ; July and August.

39. " comyntas Godt. Very rare ; July.

40. Pamphila zabulon Bd.-Lec. This species may be common earlier in the season than July 15th ; I took a rubbed Pocahontas var ♀ Scud. on July 17, 1873.

41. Pamphila leonardus Harr. Common ; end of August and during September.

42. Pamphila peckius Kirby. Common ; from middle of July to end of August.

43. Pamphila cernes Bd.-Lec. (ahaton Harr.) Common ; July.

44. " manataaqua Scud. (cernes Harr.) Rare ; one specimen taken July 20th, 1874.

45. Pamphila metacomet Harr. Common ; from middle of July to end of August.

46. Eudamus pylades Scud. Somewhat common ; July.

These are all the species which I have taken during my visits to this locality, but others doubtless occur there, especially in the spring and early summer, and there are undoubtedly early broods of some of the above species. I have, with very few exceptions, followed the classification and nomenclature of Mr. Edwards' recent Catalogue. I have given both the names *alope* and *nephele*, though I have doubted their distinctness.

DESCRIPTION OF THE PREPARATORY STAGES OF GRAPTA PROGNE, Cramer.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG.—Conical, the base rounded ; marked by 8 or 9 vertical ribs, which near the base are depressed, but on upper third are considerably elevated, increase gradually in prominence and terminate abruptly around a small depression at summit ; these ribs are compressed and their sides are cut by grooves perpendicular to the surface of the egg ; the spaces between them crossed by many fine striæ ; color green. Duration of this stage 5 days.

YOUNG LARVA.—Length .08 inch ; cylindrical, nearly even, the segments well rounded ; on 2 a black dorsal band on which are several small tubercles, with long hairs ; on the middle of each segment after 2 a transverse row of small black tubercles, three on either side of body, each with long black hair, those on the anterior segments bent forward, on the posterior ones bent back ; color at first dull green, the last segments with a brown tint ; but as the stage progresses the color becomes dull

white and brown, 5, 7 and 9 being brown, the rest white ; feet and pro-legs green ; head ovoid, black-brown, shining, with some short black hairs. Duration of this stage 4 days.

After 1st Moult.—Length .16 inch ; color greenish-brown ; there now appear seven rows of large branching spines, one dorsal and three lateral, besides an additional row of minute similar ones over the legs and feet, as with all Grapta larvæ, and these spines are found at every stage to maturity ; the dorsal row begins on segment 5 and ends on 12 ; the first lateral row begins on 3 and ends on 12 ; the second lateral row begins on 3, but is omitted on 4, and ends on 13 ; there is, however, on 4 a spine between second and third laterals ; the third lateral row begins on 5 and ends on 12 ; these spines are all long, irregularly tapering, shining black, and the tips of both spines and branches end in a black hair or bristle ; all rise from light yellow tubercles and are yellow about half way up ; on 12 and 13 they are almost wholly yellow ; on the posterior end of 12 is a row of four small spines, and on 13 two small ones between the large laterals, and others, also small, behind ; on 2 is a collar of small spines arranged two on either side the dorsal line, and behind and between these one other ; also two lower down the side ; head obovoid, bilobed, brown-black, shining, with black hairs ; on each vertex a compound black spined process. To next moult 3 days.

After 2nd Moult.—Length .24 inch ; same shape and spines generally the same, but longer, as are also their branches ; many of the latter end in white hairs ; the first laterals on the even segments 4, 6, etc., to 12, have the lower half the spines and the tubercles yellow, the odd segments have them dull yellow ; for twelve hours after the moult the color of body was largely yellow, but changed then to brown, with whitish cross lines ; head as before, the spines on vertices longer ; on the face many simple conical spines, white or yellowish, with concolored hairs. Duration of this stage 3 days.

After 3rd Moult.—Length .5 inch ; color glossy black from 3 to 11, crossed on the posterior half of most of the segments by three white, sometimes gray-white, lines ; the broad ridges on which the spines stand are marked from 5 to 11 by white or sometimes gray bars or stripes obliquely forward, from the dorsals forming a V to each spine ; from first and second laterals one bar to each spine parallel to the arm of the V on either side ; the spines are long and slender, those of dorsal row longest ; the dorsals and first laterals on 4, 5 and 6 are honey-yellow, the former to

the tips, the others are black at tip ; on 7, 9, 11 the spines of these rows are dull yellow, black tipped ; on 8, 10, 12, 13 are all dull yellow ; the second and third laterals are black on dull yellow tubercles ; on 2 a collar of small yellow spines from similar tubercles ; feet black, pro-legs greenish-yellow ; head subcordate, flattened frontally, each vertex rather high and bearing a stout black compound spine or spinous process ; the face and sides covered with small, simple, conical spines of irregular lengths, black, light yellow and reddish-yellow, each with a hair ; the sides of head and a triangle in front black, rest honey-yellow. As the body lengthened in this stage the black and white bands became more nearly equal in width, and the tubercles and lower parts of spines became of a more uniform honey-yellow. To next moult 3 days.

After 4th and last Moult.—Length .8 inch, at maturity 1 to 1.2 inch ; color buff, the cross stripes on posterior parts of segments black and pale buff ; in front of each dorsal spine is a V-shaped reddish bar, which passes round the spine (or the spine is within the angle), and there is an oblique bar of same color in front of each of the first laterals, and from its base, directed forward and downward ; the second laterals stand on a straight or slightly arched bar of same color ; the spines on 3, 4 and 5 larger than elsewhere ; the dorsals white, yellow at bottom (all yellow spoken of is reddish or honey-yellow), and from yellow tubercles ; the first laterals white from 5 to 11, but on 3, 4 and 12 are black, with buff branches ; the second laterals are all black, yellow at base and stand on yellow tubercles ; the lower laterals all white, on yellow tubercles ; the collar of spines on 2 is yellow ; spiracles black in yellow ovals ; feet black, pro-legs yellow and brown ; head sub-cordate ; on each vertex a large compound spinous process, the main stem black, the branches partly black, partly yellow ; the face and sides thickly covered with simple conical spines of irregular sizes, buff or yellow, the sides and frontal triangle black, rest yellow. The larva suspended 5 days after 4th moult and in less than 12 hours (20th May) pupated.

CHRYSALIS.—Length .7 inch, greatest breadth .24 inch ; slender, cylindrical ; the head case high, compressed transversely ; at each vertex a short stout conical projection, the space between being rounded ; mesonotum prominent, followed by a deep rounded excavation ; the carina rather slight, rounded, somewhat angular on posterior side ; the wing cases a little flaring at base, depressed laterally, the margins rounding abruptly to the body ; on the abdomen several rows of tubercles, mostly

small, but those corresponding to the first lateral larval spines are large on the anterior segments and gilded; colors dull green, brown and pink ish white; the head case and mesonotum green, and on wing cases a broad band of same hue; on the side of abdomen from wing case to tail a darker green stripe; remainder of wing cases pink tinted, and all the anterior parts are more or less mottled with pink-brown; on dorsal side of abdomen a pink stripe and on the sides some oblique pink lines. The butterfly emerged after 8 days.

There is much variation in both larva and chrysalis. The foregoing description is drawn from examples obtained from eggs sent me by Mr. C. H. Roberts, at Factory Point, Vermont, in May, 1878. There were nine eggs, and besides the larvæ from these, Mr. Roberts sent two others half grown. All these larvæ were much alike, and they differed so much from other *Progne* larvæ which I found at Hunter, in Catskills, in July, 1877, that I did not believe they could be of the same species. In fact, I thought I was feeding the larvæ of *Gracilis*, a species allied to *Progne* and *Zephyrus*, and whose preparatory stages must be closely like those species. These Catskill larvæ were found on a currant bush near the house at which I was residing. They were four in number, all past last moult and alike; the general color was buff, marked with black; the anterior half of segments 3, 4, 5 was of a more sordid buff; on 6 began to appear imperfect black bands, which on the middle segments were complete and conspicuous, but on the posterior ones were somewhat indistinct as well as broken (these were the V-shaped and oblique bands before spoken of); also on the anterior edge of each of these segments, fronting the dorsal spine, was a small black patch; on the posterior part of segments 3 to 12 were narrow transverse stripes, 8 in number, the 1st, 3rd, 5th and 7th of which were black, the 2nd and 8th yellow-buff, the 4th and 6th gray-buff; of these the yellow were most conspicuous; on the sides of 6 to 12 was a large fulvous patch on each which crossed the bases of 2nd and 3rd laterals, and between these two rows was a black band on which were the spiracles; in line with third laterals was a narrow buff ridge, buff except where it crossed the fulvous patches; and a black band ran along base of body, covering the upper part of the pro-legs; the dorsal spines were whitish, in part pink at base; the first laterals were black and white, 3, 4, 5 and 7 being black with some white branches, the others white with black tips; the second laterals were all black, and the third were either white or black with white tips; the face was black and red, along the cleft

buff. The larvæ measured 1 2 inch. The chrysalids were .8 inch long; the color generally a dull green mixed with pink and white, no where decided; the wing cases yellow-brown with a faint green tint in parts. To imago 9 days.

In 1879 I received two half grown larvæ of *Progne* from Prof. C. H. Fernald, at Orono, Maine, and in some respects these differed from all the others I had before seen. After third moult, the general color of body was as in the Vermont larvæ, that is, black, banded with whitish lines on posterior parts of the segments; but the dorsals and first laterals were all pale fulvous, all tips being black; the second laterals were reddish on anterior segments, gradually running into black on the posterior ones, but the branches always fulvous, the lower laterals sometimes black on upper part; and every spine on the body rose from a fulvous tubercle.

At the last stage these larvæ were red-buff on segments 3 to 5, and on 12, 13; all dorsals were pale fulvous; the first laterals on 3, 12, 13 black with fulvous branches; all others of this row, and all of third lateral row pale fulvous like dorsals; the second laterals black on 3 and on 11 to 13, the rest pale fulvous; and all tubercles fulvous. One larva died, the other reached chrysalis, and resembled the Vermont chrysalids.

By this it appears that there is wide variation in the last two larval stages both in color, markings and the appearance of the spines; so is there in the chrysalis. I had no opportunity of comparing the earlier stages. The Catskill larvæ had an excess of black at maturity, with large fulvous patches on the sides, contrary to what was seen in any other larvæ. These larvae were of the second brood, whereas all the others observed were of the first, and this may account for the great difference.

Mr. Roberts found the eggs laid on wild gooseberry and Prof. Fernald took the larvae he sent me from same plant. I found that they eat cultivated gooseberry and currant readily. They do not fold down a leaf to protect themselves as do the larvae of species of the *Comma* sub-group, (viz., *Satyrus* and *Comma;* also as does *Interrogationis*) under which these larvae conceal themselves and on the edges of which they feed until the leaf is too far consumed to afford a shelter, when they migrate to another and bend it in the same way. But *Progne* larvae lie exposed on the stems or on the under side of the partly eaten leaf. In the later stages they have a very odd habit of holding themselves when at rest. The anterior segments arched and turned round at a right angle to the rest of the body, the middle segments bent in, and the last three segments often

thrown high in air, as in certain species of heterocerous larvæ. The larva then rests wholly on the abdominal legs. I have seen nothing like this in any other Grapta larva.

The species is not found in the district in which I now live, but it is abundant in parts of New York and New England. In the Catskills it is double brooded, the first brood of butterflies appearing in early summer, the last in August, and these hybernate.

NOTES ON THE LARVA OF AGROTIS LUBRICANS.

BY G. H. FRENCH, CARBONDALE, ILL.

Several times during the last of August and the fore part of September, while working in my garden, I found a caterpillar that without the use of the lens was green with a white stripe on each side. A more minute description would be as follows :

Length when full grown, 1.25 inches, the shape of the body very much like that of *A. saucia*. Color grass green, marked with white and black as follows : A broad sub-stigmatal line of creamy white that is edged a little above, towards the head, with black ; and below, in the middle of each segment, by a little clouding of the same. On some there is a very faint subdorsal line of greenish white, edged below with black, but on most only the fine black line is perceptible. Dorsal line very narrow, greenish white. Piliferous spots very small, faintly black, from each of which arises a short hair. Stigmata edged with black.

By a casual examination this is a grass green caterpillar with a white stripe on each side, all the other marks being so faint as to be seen only upon closer inspection. The larva reared ceased feeding Sept. 6, and went below the dirt in its box to transform, producing the imago Oct. 8.

Besides the one reared, I took several specimens of the moth here in July, and from this I judge the species to be at least two brooded, possibly three, but that would depend upon the condition in which it hybernates.

CRAMBIDÆ.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

CHILO CRAMBIDOIDES, n. s.

A large stout species with the aspect of Crambus. Fore wings pale ochre with two parallel curved, dusky, interrupted extra mesial lines; a row of terminal black separated dots; fringes concolorous. Hind wings pure white, with white fringes. Head and thorax pale ochre. Beneath very pale; the veins conspicuous. Abdomen whitish; second and third basal segments ochre shaded above. I do not detect ocelli. Expanse 38 mil. Hab. Kansas, Prof. Snow. Prof. Zeller writes me that this form may be finally referred to Guenée's genus "*Borer*" (?) of which I know neither type nor description.

SCHOENOBIUS MACRINELLUS Zell., St. Ent. Zeit., 1866, p. 152, Taf. I, fig. 12.

This species is described from Venezuela. Mr. Schwarz has collected a specimen at Enterprise, Florida, May 12, which must be the same species. It only differs from Zeller's figure and description by the want of the terminal points on the wings and the fact that the fringes on primaries are whitish gray. It is new to our fauna. In this same paper of Prof. Zeller's is a description of the North American *Crambus topiarius*, which I mention further on and which Prof. Zeller regards as the North American representative of the European *hortuellus*.

CRAMBUS INTERRUPTUS Grote, CAN. ENT., ix., 101.

I have sent a series of specimens to Prof. Zeller and he informs me that he can find no constant character to separate this species from the European *myellus*, unknown to me, and not previously registered from this country. There seem to be slight differences in the tone of the secondaries, and at first Prof. Zeller thought that there might be in the position of the vitta, but later examples seem to have corrected this latter supposition, judging from Prof. Zeller's letters. *Myellus* is obtained in Europe with the beating net from trees; *conchellus* Tr. is found flying on the treeless alpine meadows. It will be interesting to know the habits of *interruptus*. I was in error in comparing this species with the European *conchellus*.

CRAMBUS DISSECTUS, n. s.

The markings show a resemblance to *saltuellus*, but the species is nearer in some respects to *interruptus*. Color a deep brown. A white shaded stripe along internal margin. A median white stripe ending at extremity of cell, and toothed on its lower edge near the end. A white patch beyond the cell between the tip of the median stripe and the exterior line. A white shade patch above this on costa. The line is ochre brown, shaped as usual, rather sharply angulated, followed by a faint white shade line. Terminal space with a white patch below apices and a narrow white stripe following the margin from the angulation of the exterior line and enclosing a series of black dots, fragments of the terminal black line, which is even on the infra-apical white patch. The terminal markings resemble *bidens*, but the lower white stripe is narrower and even throughout. The white is not so silvery. Disc of thorax and head above white. Tegulae brown. Hind wings smoky fuscous, with pale fringes. *Expanse* 20 mil. One specimen from New York. Distinguished by the white stripe on internal margin of primaries.

CRAMBUS LEACHELLUS Zinck.

This species, which I believe to be Walker's *hastiferellus*, occurs also in Vancouver's Island, from whence I have three specimens, No. 5925, from Mr. Hy. Edwards.

CRAMBUS OCCIDENTALIS, n. s.

Three specimens from Mr. Behrens taken in Sauzalito, Cal., Oct. 8–10, seem to be closely allied to *Leachellus*, but to indicate a different species. The median white stripe is well removed from costa and narrower, the lower tooth very distinct. Along the lower edge of the stripe is a black marginal shade at base; and beyond the tooth there are three or four short and thick oblique black dashes to the tip of the stripe and standing out from it. The hind wings are pale fuscous, darker than in *Leachellus*. The terminal markings of fore wings are similar. The general color is a deeper brown. It may be only a local modification of *Leachellus*, but it is easily distinguished.

CRAMBUS EXESUS, n. s.

Color of *Leachellus* but with the white stripe extending through to external margin, where it is bent upwards to near the tip of the wing and colors the fringes white. A terminal series of white, black-centered dots

visible below the median stripe. Costal edge narrowly whitish. Hind wings white with white fringes. Thorax brown. *Expanse* 25 mil. Hab. New York. I sent a specimen to Prof. Zeller, who knew the species, but had no name for it and placed it between *latistrius* and *halterellus*. The median stripe is evenly margined, without tooth, and the brown of the wing takes a deeper tone along its edges and appears as a deeper streak at apices.

CRAMBUS VULGIVAGELLUS Clem., Pr. Acad. N. S. Phil., 203, 1860.

Four specimens from Vancouver's Island (Hy. Edwards' coll., No. 4644) are a little smaller than Eastern examples, but should, I think, be referred here, as I see no other differences.

CRAMBUS GOODELLIANUS, n. s.

Pale ochre yellow, head and thorax whitish ; fore wings dusted longitudinally with fuscous. An orange line crosses the wing at beyond the middle, twice feebly dentate, on the cell and again on vein 2. The usual transverse outer line is orange and bent as usual opposite the cell. Terminal space narrowly orange inferiorly. A terminal series of minute black points. Fringes metallic. Hind wings very pale, whitish with ochrey tinge ; fringe white. *Expanse* 20 to 25 mil. Hab. Amherst, Mass., L. W. Goodell ; Penn. Larger than *topiarius* and differing by the median ochre yellow line.

CRAMBUS TOPIARIUS Zeller.

A specimen is sent me from Mr. Hy. Edwards from Sierra Nevada, Cal. It is smaller than Eastern specimens ; the hind wings quite dark ; else it does not differ.

CRAMBUS OREGONICUS, n. s.

In color resembling *elegans;* larger, with more pointed primaries and oblique outer margin. Light brown. A longitudinal diffuse white stripe runs from base below median nervure and extends over the nervules. A deep brown acutely dentate mesial line, of which sometimes but a brown dash on submedian space and another at extremity of disc is visible. The outer mesial line is brown, lined with white. Fringes brownish with a fine white basal line. Hind wings pale fuscous with narrow terminal line and white fringes. *Expanse* 17 mil. *Hab.* Oregon, two specimens, Coll. Mr. Hy. Edwards, No. 5923.

CRAMBUS ANCEPS, n. s.

♂ ♀. Belongs to the group of fuscous species with the primaries crossed by two angulated dark lines. Narrow-winged; deep brownish fuscous; outer line followed by a faint narrow pale shading; inner line fused with a dark outer discal spot; lines irregular and rather broad, angulated on cell. Hind wings fuscous with fuscous fringes and traces of an extra mesial shade line. Head and thorax dark fuscous; legs paler; wings fuscous beneath. *Expanse* 18 mil. Sauzalito, Cal., Behrens, Oct. 6, two specimens.

CRAMBUS LACINIELLUS, n. s.

♂ ♀. This species, of which I have examined large material, principally collected by Mr. Fish in Maine, is allied to *fuscicostellus*. It is larger, without the median gray shade, but shades gradually from the ochrey fuscous costal region to the paler and grayish internal region of the primaries. There is a very narrow bright line between two black hair-lines at the base of the fringe. The wing is crossed by two broken rusty lines, the inner more oblique, both more or less faint and incomplete. The hind wings are very pale fuscous, paler than in *fuscicostellus*. Prof. Zeller has drawn my attention to the existence of allied species to *fuscicostellus*, but not until recently could I satisfy myself as to what the latter species was. According to the description "spatio inter costam et venam medianum distincte canescente" and Prof. Zeller's recent determination of a specimen sent him under the letter "d," I now recognize his species from Texas and N. Y. It is smaller and deeper colored than *laciniellus*, the gray median striped shade extends over the middle of the wing, diffusely continued in some specimens to external margin. The outer of the two lines is broken into dots and the lines are narrower and deeper colored. The fringes are darker, shining fuscous, and I cannot see the double hair-lines of *laciniellus*. The latter expands 26 to 29 mil. Mount Desert (Grote); Orono (Fish). I have sent this species to Zeller under the Nos. 2 and 30.

CRAMBUS ATTENUATUS, n. s.

Fore wings narrow, dusty ochrey fuscous with an ill-defined median gray or whitish stripe extending outwardly diffusedly along the veins to external margin. This stripe is crossed at the middle of the wing by an oblique brown line, not always legible, the fragment of a mesial line. Exterior line very near the margin, only visible in a double, outwardly

oblique line before the apices. Hind wings fuscous with whitish fringes. *Expanse* 24 mil. *Hab.* Vancouver Island, Coll. Mr. Hy. Edwards, No. 5927. This species is narrower winged than *fuscicostellus* and paler, more ochrey colored.

Crambus (Propexus) edonis, n. s.

♂ ♀. Male antennæ lengthily pectinate. Labial palpi excessively long. Front flat, not acuminate and produced as in *vulgivagellus*. On these characters I found the new group, including in it *pexellus*, *pectinifer*, *edonis* and an unnamed Texan form, perhaps the same as the latter. The new species is allied to *pexellus*; male antennæ bipectinate; fore wings pale salmon red, without markings, dusted on the interspaces longitudinally, and especially terminally with fuscous. Palpi dark externally. Beneath dark fuscous: costa of primaries reddish over basal two-thirds. Legs fuscous. Hind wings fuscous with paler fringes. Fringes on primaries fuscous. Thorax fuscous; tegulæ and head reddish. *Expanse* 36 mil. *Hab.* Kansas, Prof. Snow. One fresh specimen, No. 288; one male, two females from Mr. Ashton. The females are plainer and more faintly colored, the antennæ are simple, the hind wings paler.

I have received from Texas a form which has paler hind wings in the male and has not the reddish tinge of *edonis*. Entirely pale dusty ochre. Male antennæ bipectinate. Wings apparently narrower than in *edonis*, but as long, longer than in *pexellus*. Fore wings ochrey with faint fuscous shades and traces of brighter longitudinal tintings. No markings. Hind wings whitish at base, becoming dusty ochrey outwardly. *Expanse* ♂ 33, ♀ 38 mil. *Hab.* Texas (Belfrage, No. 454; Belfrage's number for *pexellus* is 455). Three specimens examined. This form may fall in with *edonis* on the discovery of fresher specimens, but it is not unlikely distinct.

CORRESPONDENCE.

I have again to record the scarcity of butterflies during the past year, not only in the vicinity of St. John, but in other parts of this Province and in Nova Scotia. This scarcity is particularly noticeable in some of our more common species, which a few years ago were so numerous. I did not observe a single specimen of *P. cardui* or *P. huntera* last summer, although the larvæ were so abundant in 1878. *Pieris rapæ* and *Colias philodice* are fast disappearing from this locality. Botanists who have visited distant parts of N. B. during the past summer, in their collecting

tours, inform me that they have seen very few butterflies of any species. Intelligent—non-scientific— observers in Nova Scotia furnish me with like information. Moths have also been exceedingly scarce. Indeed, this scarcity is observable in all kinds of insects, with the exception of a few species of Dragon-flies, which have been unusually abundant near St. John.

CAROLINE E. HEUSTIS, St. John, N. B.

On July 18th three examples of *Spilosoma virginica* Fabr. emerged from their cocoons. The larvæ were fed on sorrel. One of the moths (a female) has a very curious process on each side of the thorax in front, near the costa of the fore wings at the base. They are globular in form ; of a pale yellowish color, but with a vitreous lustre, and look like another pair of eyes that protrude from the head somewhat, except in color. Their diameter would measure, I should think, about one-half line. On touching the organs with an instrument I found them quite hard, and apparently of a permanent nature. I have raised several others this season of both sexes, but in none of them was there any trace of these processes, as far as I could see. I have never seen upon any insect, nor have I ever seen described any organs that correspond at all with these. If any one would like to examine this specimen, I will forward it to them for that purpose.

Aug. 1st I accidentally made a discovery that thereafter facilitated the capture of many species of moths, and thinking that it might be new to other collectors, I give it for their benefit. As I was returning home from my baited trees I beat a few bushes for moths as usual, when on beating a particular clump of scrub oaks a large number of moths flew out, many of them quite large Noctuids. I saw that there must be an unusual attraction there, but what it was I did not then find out. Many of the moths returned to the bushes again soon after being routed. At the time of discovery there must have been several hundreds in the clump, for I captured about a hundred in from fifteen to twenty minutes. I afterwards obtained a large number of moths there, and found that the greatest attraction seemed to be a sort of gummy juice (probably saccharine) that existed in the new buds that were nearly matured for another season's growth, although they were also found more or less plentifully on the youngest stems and leaves. Although other clumps of scrub oaks were afterwards examined, I found very few in other localities. I obtained from this clump of oaks many species that I had never taken before, and that I found no where else. J. ELWYN BATES, So. Abington, Mass.

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ON CERTAIN SPECIES OF SATYRUS.

BY W. H. EDWARDS, COALBURGH, W. VA.

1. NEPHELE.—Kirby, Faun. Bor. Amer., 1837, described this species as follows: "Wings brown; primaries both above and below with a paler submarginal broad band including two eyelets: the upper ones surrounded by a paler atmosphere, with a black iris and white pupil; on the under side the atmosphere of the eyelets is most distinct and forms a kind of glory round them," etc. Nothing is said of the sex, but apparently this is the description of a female. The wings of the male are blackish-brown, usually of uniform shade throughout—that is, in the typical male, corresponding to the female of Kirby. But there is a frequent departure from this type in the direction of *Alope*, the "pale atmosphere" about the ocelli appearing in the male, and in both sexes gradually widening and becoming less obscure till it culminates in a clear yellow band. When this is reached we have *Alope*, Fabr. So that *Nephele* intergrades completely with *Alope*. But this is not everywhere and always. The metropolis of the typical *Nephele* is in Canada and northern New England, that of *Alope* in the States south of New York. There is a line running about with the southern boundary of New York, or it may be, in Pennsylvania, below which *Alope* holds sole possession, and no tendency is discoverable towards *Nephele*. In the extreme northern area, if there is any departure from typical *Nephele*, it is the exception, not the rule.

Mr. Scudder, in his essay on The Distribution of Insects in New Hampshire, 1874, says of *Alope*: "This insect is tolerably abundant, sometimes very common, in the southern half of New England. The most northern localities . . . . are Norway, Me., Thornton and Shelburne, N. H., and Sudbury, Vt." Thornton is just south of the White Mountains, and Shelburne is close by the mountains on the northeast. Of *Nephele* he says: "It is foun dover the whole northern half of N. E. in great abundance. The only locality in which I have met with it is in Massachusetts, in the elevated region about Williamstown," &c.

This place is in the north-west corner of the State, next the Vermont line, and the elevated region spoken of is a continuation of the Green Mountains. So it appears that *Nephele* comes down to the Massachusetts line and *Alope* flies as far as the White Mountains. In the intervening district the intergrades fly just as in New York.

I made application to Canadian lepidopterists for information about the occurrence of *Alope*, and soon ascertained by examples sent me that *Nephele* with a pale atmosphere, but not at all indicative of a band, passed by the name of *Alope*. Thereupon I sent a typical *Alope* to Mr. William Murray, of Hamilton, who kindly offered to make inquiry of his acquaintances in different sections of Ontario. He replies, 31st Dec., 1879: "I now send you my information. Of all my correspondents not one has ever seen an *Alope* that has been taken in Canada, but *Nephele* has been taken by all. I begin to think that *Alope* is not to be found in Canada at any point."

Mr. H. H. Lyman writes from Montreal: "In July, 1876, I spent a couple of days at a farm near Freligsburg, P. Q., one mile north of the Vermont border, and found *Nephele* very common. Most of the specimens taken showed a yellow ring about the eye-spots on primaries, but one of them shows on upper side a somewhat faint, but quite discernible, patch corresponding to the yellow band of *Alope*. Was at same place in 1877. *Alope* was not seen either year." Mr. Caulfield writes Mr. Lyman: "I have never taken a specimen of *Nephele* showing any tendency towards *Alope*, nor have I seen any Canadian examples showing it." Mr. Lyman adds that at Portland, Maine, where he collected several summers, *Alope* was common as well as *Nephele* and all intergrades.

(To the west of New York, in the latitude of the belt spoken of, it is believed that the two forms fly together at least as far as Wisconsin. Prof. A. J. Cook writes that both are common in Michigan, south of the latitude of Grand Rapids At Toledo, Mr. John Wilson writes that *Nephele* is rare, and *Alope* unknown, so far as appears. At Cleveland, O., Dr. J. F. Isom informs me that *Alope* is very rare, but that *Nephele* is abundant in some seasons. In south-west Ohio, Dr. H. K. Landis, of Columbus, writes that he cannot learn that either form has ever been taken. They are not mentioned in Mr. Dury's list of butterflies found about Cincinnati. But in northern Illinois *Nephele* is abundant and *Alope* not found at all. So that somewhere between New York and Illinois, in Ohio and Indiana, *Alope* seems to disappear, while *Nephele* be-

comes the sole form; but whether the separation is abrupt or gradual is not ascertained. As the information which I have been able to gather is so meagre as regards the States west of New York, I shall confine my remarks to that State and New England.*)

We have therefore in these separated districts two apparently good species, answering to any definition of that name. But between, there is a belt of latitude passing through New York and southern New England, where in one section or other both types are found and the whole series of intergrades. In this belt *Alope* and *Nephele* are found to be dimorphic forms of one and the same species. I formerly was of the opinion that they were distinct species, though in some districts there were intergrades. I thought these approaches of one to the other did not bridge the whole space between. In a paper printed in Proc. Ent. Soc. Phil., 1866, I gave my reasons therefor. But some observations made in July, 1876, at Martha's Vineyard, led me to suspect a closer relationship between the two species or forms. In the open country back of Oak Bluffs, I found these butterflies fresh from chrysalis, and in considerable numbers. They were all very black, diminutive, and there was every grade from what I had been in the habit of calling *Nephele* to unquestionable *Alope*, with a broad clear-colored band. The band was not yellow, however, as in the typical *Alope*, but reddish-yellow like that of *Pegala*, which Fabricius called *rufa* in distinction from *flava*, applied to *Alope*. Mr. Scudder took the same small reddish-banded form on Nantucket, which island is about 30 miles from the mainland, Martha's Vineyard being about 7. I call this variety *Maritima*, but whether it is restricted to the islands, or appears on the adjacent coast, I am not yet advised. Mr. Mead obtained for me a large number of eggs of this butterfly, while at the Bluffs shortly after my departure. They were laid by the broad-banded females in confinement and mailed to Coalburgh. There the larvæ hatched out, and these as well as the eggs were found to be precisely like the same stages of *Nephele* from Catskills. But none of the larvæ survived the winter.

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* I shall be greatly obliged to any readers of this who will give me information as to the occurrence of *Nephele* or *Alope* west of New York. Two plates of Part IX Butterflies of North America will be devoted to the illustration of these forms and varieties, and intergrades, and I desire to make the history of the species as complete as possible in the text.

In the belt spoken of, *Nephele* rather keeps to the highlands. It is the prevailing form in the Catskills, if with it are classed the intergrades, but full-banded *Alope* may be taken in small numbers every season. Along the Hudson River, *Alope* is the common form, but I have received intergrades very near to *Nephele* from Mr. Hulst, taken at Hoboken, N. J.; and a black *Nephele* ♂ from Mr. H. Laitloff, which he writes me was taken some five years since near Greenville, Jersey City. It was so unusual a form that Mr. Laitloff sent it to me for name. At Coalburgh, W. Va., *Nephele* is never seen, but *Alope* is the only form; and so on southward.

2.—*Alope* was described by Fabricius, Ent. Syst., 1793, as fuscous *(fusca)* with a yellow *(flava)* band; with two ocelli on fore wings; on hind wing one ocellus above, six below. The band is very broad in the female, usually narrower in the male, pale yellow in both sexes. The ocelli resemble those of *Nephele* and vary in same manner. Usually they are round, but sometimes oval; are either small or large, often equal, but sometimes the upper is larger, at others the lower. Now and then a third pupilled ocellus appears, and individuals have been taken with but one ocellus (the upper). It is not very unusual to find examples in which a black point, or what may be considered as a rudimentary ocellus, presents itself. On the upper side of hind wing is often a small but complete ocellus near inner angle, but in many cases it is partly or wholly wanting; and occasionally there are one or two black spots in addition. The males in the majority of examples have six small ocelli on the under side of the hind wings; the females rarely have six, and often none at all. At the north, *Alope* is blackish-brown, more brown in the female; but to the southward brown prevails in both sexes; and it is of a lighter shade, while the under side has a tint of yellow more or less decided over whole surface, often mixed with gray. The band is of yellow, or with a slight ochrey tint. This is a description of the extreme southern type, and to distinguish I call it var. *Texana*. All examples from Texas which I have seen have a complete anal ocellus, and six ocelli beneath, of pretty large size—larger than in northern *Alope*—in distinct ochrey rings; the pupils white points with a few blue scales about them in the larger ocelli. Of 70 *Nephele* ♂ examined, 50 have 6 ocelli, 11 have 5, 3 have 4, 3 have 3, 2 have 1, 1 has 0.

Of 55 *Nephele* ♀, 6 have 6, 1 has 5, 4 have 4, 13 have 3, 7 have 2, 13 have 1, 11 have 0.

Of 24 *Alope* ♂, 15 have 6 ocelli, 3 have 5, 4 have 1, 2 have 0.

Of 25 *Alope* ♀, 12 have 6, 1 has 4, 4 have 2, 4 have 1, 4 have 0.

Therefore of *Nephele* ♂, 71 per cent. have 6 ocelli, 4 per cent. have under 3; 1.4 per cent. have 0.

Of *Nephele* ♀, 11 per cent. have 6, 56 per cent. have under 3, 20 per cent. have 0.

Of *Alope* ♂, 62 per cent. have 6 ocelli, 25 per cent. under 3, 8 per cent. 0.

Of *Alope* ♀, 24 per cent. have 6, 48 per cent. have under 3, 16 per cent. have 0.

3.—The dark Satyrus which inhabits Illinois and westward has gone by the name of *Nephele*, though differing somewhat from *Nephele* of the east. I was struck by the difference between a series sent me by the late Mr. Walsh from Galena, years ago and when I first began collecting butterflies, and a series of *Nephele* taken in the Catskills, and I have always kept the two apart in my cases, considering the Illinois form as at least a well marked variety. Mr. Worthington has recently written me: "I have received a lot of *Nephele* from New Hampshire and am surprised at the difference between them and the Illinois *Nephele*."

The males of this last are almost black, the ocelli are very small and without rings. But in some examples there is a faint russet or yellowish tint about the ocelli, and perhaps on the space between them. On the under side the rings are russet or ochraceous, on both wings. The females are almost invariably and uniformly dark, and only occasionally is there a paler shade over the extra discal area of fore wings. Out of a number of females I find but one in which there is a clouded yellow space about the ocelli, and only three on which there are yellow, though hazy, ocellar rings. Of 16 ♂, 14 have 6 small ocelli beneath, 1 has 5, 1 has 2. Of 19 ♀, 2 have 6, 2 have 5, 6 have 4, 2 have 3, 6 have 2, 1 has 1. This form prevails exclusively to the Rocky Mountains. I have received it from Nebraska, Montana, Colorado and New Mexico, but *Alope* is unknown to me from that region.

In Can. Ent., ix., 141, 1877, I gave the history of *Nephele*, bred from eggs laid by a typical female from the Catskill Mountains, Hunter, N. Y. In fall of 1878, I wrote to several correspondents for eggs, and by their good will obtained many. Prof. Lintner and Dr. Bailey sent eggs of *Alope* from Albany, N. Y. Rev. Mr. Hulst, with the zeal and kindness which distinguishes him, crossed the rivers from Brooklyn to Hoboken, and

brought away females of *Alope*, from which he obtained eggs for me. I got *Alope* eggs here at Coalburgh from three females. A friend at Hunter sent eggs of *Nephele*, and Mr. Worthington sent many of the Illinois form from Chicago. In each case the parent was sent with the eggs that the type might be noted. From Albany, Hoboken is 150 miles south; Coalburgh 800 miles southwest; Hunter is 35 miles southwest of Albany and of about 2,000 feet greater elevation. Chicago is about 800 miles northwest of Coalburgh and 1,000 west of Albany. So that the five localities are separated by considerable distances, and there has probably been no intercommunication at any time so far as these insects are concerned.

The eggs of the six lots were kept apart and as the larvæ hatched (at from 14 to 28 days from deposition, depending on the temperature), they were placed on sods in separate pots and left in the coolest room in my house. But some of the Illinois eggs were sent to Mr. C. P. Whitney, at Milford, N. H., who offered to put them on ice. I wished to try the effect of cold in retarding the hatching. Early in February I received the boxes again and found a number of healthy larvæ, with a few unbroken eggs. These last proved to be dead. The eggs had been sent in a paper pill box which was within a flat tin box, and this was set directly on the ice. The young larvæ when I received them were fixed to the rough sides of their box and had not been attacked by mould, the enemy most to be dreaded. Mr. Whitney wrote that he was notified in December that the ice-house was empty, and he thereupon removed the tin box without opening it, and placed it in a snow bank, where it remained till I sent for it. The larvæ may have been emerging from the eggs when he first received them, or perhaps did so in the interval between ice-house and snow. This method of keeping larvæ which become lethargic immediately upon leaving the egg will probably be found successful with all species of butterflies which have that habit—as the large Argynnids—and make it possible to breed them in numbers. I have been unable to find any other mode of wintering such larvæ without a certain loss of most of them.

On 23rd Jan., 1879, I transferred such of the Satyrid larvæ as were living (and this included some of each lot) to fresh sods, and 28th Jan. noticed that several were feeding. One Hunter *Nephele* passed 1st moult 23rd Feb'y, and before 4th March several of the same lot had passed the moult. But the Illinois *Nephele* and all *Alope* lingered. One Coalburgh *Alope* and one from Hoboken passed 1st moult 7th March, by which date

the Hunter *Nephele* spoken of was swollen for 2nd moult, which it passed two days later. Two Illinois *Nephele* passed 1st moult 8th March. To the end some of the Hunter *Nephele* were in advance of all, and some of the Illinois examples lingered behind all. The stages of Coalburgh *Alope* were as follows :

1st moult passed	7th March.	
2nd " "	21st "	1st to 2nd—14 days.
3rd " "	14th April.	2nd to 3rd—24 "
4th " "	2nd May.	3rd to 4th—18 "
In chrysalis	26th "	4th to chrys. 24 "
Imago issued	9th June.	chr. to imago 14 "

Of Hunter *Nephele* I find no notes, but in 1877 the stages were

1st moult	to 2nd—23 days.
2nd "	to 3rd—14 "
3rd "	to 4th—14 "
4th "	to chry.—28 "
Chrys.	to imago—14 "

Of Illinois *Nephele* the stages were :

1st moult passed	8th March.	
2nd " "	21st "	1st to 2nd—13 days.
3rd " "	9th April.	2nd to 3rd—19 "
4th " "	26th "	3rd to 4th—17 "
In chrysalis	17th May.	4th to chry.—21 "
Imago issued	30th "	chry. to im.—13 "

The eggs of all these forms are alike, not to be distinguished from each other. They are conoidal, truncated at top and slightly arched ; marked by about 18 vertical ridges running from base to top, the spaces between excavated roundly, and crossed by fine striæ : the top is covered with shallow cells, the outer ones irregularly hexagonal, the inner long and narrow about a central oval cell.

Nor can the larvæ of these forms be distinguished from each other up to second moult. The young, of first stage, are very peculiar and quite unlike what they become after first moult, as well as unlike all other Satyrid larvæ which I have bred. Under the microscope they look like the vertebræ of a fish, by reason of the many rows of long hooked bristles, those of upper and lower rows being curved back, the middle row for-

ward. General color carnation, with a medio-dorsal line, and three lines on each side, all of crimson. After 1st moult the color is green, and the stripes, which are the same in number and position as the lines of first stage, are dark green ; the hairs short and straight.

After 2nd moult the color becomes yellow-green and the stripes are changed. There is now a dark green one on middle of dorsum and a yellow one covering the ridge over the feet. On 24th March, I compared Hoboken *Alope*, Hunter and Illinois *Nephele*, of same age, all lately past second moult, and could see no difference whatever between them. Some *Alope* and Hunter *Nephele* were much covered with long hairs which were bent to the surface and gave them quite a shaggy appearance. But others did not show this peculiarity.

On 18th April, I compared Coalburgh *Alope* and *Nephele* from both localities, all past 3rd moult ; length from .68 to .75 inch. All were yellow-green and in general alike ; all had the yellow basal ridge, but in addition to this, the Illinois *Nephele* had a distinct longitudinal yellow stripe on upper part of side, and on either edge of the green dorsal stripe was a fine yellow line. The Hunter *Nephele* showed very faint traces of the yellow side stripe ; the *Alope* none at all.

Comparing another Coalburgh *Alope* and Hunter *Nephele* a few days later, both past 3rd moult, neither showed traces of these lines and I could see no difference between the two.

At 4th moult all the Illinois *Nephele*, now .7 inch long, showed same peculiarities as at last stage. No other larva of the several lots presented the yellow lines so plainly at the same age, that is, just after the moult ; but there were one or more *Alope* and Hunter *Nephele* which gave indications of the side line, and this came out more distinctly as the stage progressed. But most were without the side line.

Comparing mature larvæ :

One Albany *Alope*, length 1.25 inch, greatest breadth .16 inch ; color very yellow-green, no yellow side or dorsal stripes or lines.

One Coalburgh *Alope*, length 1.6, gr. br. .2 inch ; color yellow-green, the side more green than dorsum ; a yellow side line, quite indistinct.

Hunter *Nephele*, 3 examples ; length of one 1.2 inch, gr. br. .15 inch ; of another 1.15, br. .16 inch. Two were yellow-green, of same shade as nearly all the Coalburgh larvae. One was more decidedly

yellow, with less green; but in none was there a yellow side stripe or the fine dorsal lines.

Illinois *Nephele*, length 1.36, gr. br. .14 inch. Color bright yellow-green, the dorsum more yellow than side; on the side as broad a yellow stripe as the one along basal ridge, and the green dorsal stripe edged by yellow.

Summary as to larvæ:

The five lots could not be separated before 2nd moult. After that, through the stages to maturity, the *Alope* from different localities and the Hunter *Nephele* varied somewhat in the shade of green, being more or less yellow; in some yellow prevailing on dorsum, green on sides; all had the yellow band on basal ridge, either pale or deep colored. If the yellow side line was present, as in some examples it was, it was indistinct, or obsolescent. They varied also in the hairy surface, some having the hairs short and upright, others long and bent down. The Hunter *Nephele* could not be distinguished from *Alope* by any permanent character.

The Illinois larvae were deep yellow-green after second moult, and the side stripe was always present and distinct. The hairs were never long and bent. The larvae were distinguishable from all the others.

Comparing chrysalids:

One Albany *Alope*, A. length .56 inch, greatest breadth .21 inch; color deep green, covered with smooth specks and patches of a lighter color, but which scarcely affect the general green hue; top of head case, ridge of mesonotum and ventral edges of wing cases cream color. This was the only one I obtained, and it produced a male butterfly.

One Hoboken *Alope*, same size and color, and produced a male.

One Hunter *Nephele*, length .6, br. .2 inch; was precisely like the Albany *Alope* in appearance, and produced a male.

Another Hoboken *Alope;* color yellow-green, and on the dorsum were three longitudinal yellow bands, one on middle of abdomen, ending at base of mesonotum, the others sub-dorsal, extending from last segment to head. This died before imago.

One Coalburgh *Alope;* length .8, br. .24 inch; bright yellow-green, covered with the lighter specks and patches, but not so as to obscure the ground; the wing cases clouded with darker green in long stripes; the three yellow dorsal bands as in the *Alope* last mentioned; edges of head, wing cases and mesonotum cream color. This produced a female butterfly, with broad yellow band and like the parent.

Another Coalburgh *Alope*, length .6, br. .22 inch; like the foregoing, being both banded and clouded. Produced a female butterfly, with broad yellow band.

One Hunter *Nephele*, B; color yellow-green, bands and clouding of wings present but indistinct. Produced a female.

Three Hunter *Nephele*; all yellow-green, with no bands or clouding; the edgings cream color. These all gave males. The chrysalis described CAN. ENT., ix., 143, produced a female, but showed no band or clouds; the edgings cream color.

Two Illinois examples; length .6, br. .22 inch; color a pale blue-green, the powdery covering giving a whitish hue to the whole; no bands or clouds; the edges of mesonotum, head and wing cases white. Both these gave males. I obtained no females from this lot.

Summary as to chrysalids:

The largest *Alope* and Hunter *Nephele* were alike in color and in dorsal stripes, clouds on wings, and edgings of head case, etc.; but the bands and clouds were most distinct in *Alope*. All these large chrysalids produced female butterflies. The plainer and smaller chrysalids were male. But one female *Nephele* chrysalis is recorded as without clouds or bands.

The Illinois chrysalids were of same shape as the rest, but were small and plain colored, and were blue or whitish-green; the edgings white instead of cream color. They were readily to be distinguished from any other.

Results in butterflies:

The chrysalis A, Albany *Alope*, gave a male not differing from many males taken at Hunter, and which there I always regarded as true *Nephele*, though off type, being without band, but with a narrow yellow nimbus about the ocelli and connecting them, the edges everywhere fading into the black ground.

On the other hand, the chrysalis B, Hunter *Nephele*, gave a typical female *Alope*, with a broad and clear yellow band. The female which emerged in 1877 from the Hunter *Nephele* before spoken of had both ocelli surrounded and connected by yellow, and stood midway between the types of the two forms.

The two chrysalids from Illinois, as I have said, gave males; one wholly dark, the irides without rings; the other had a faint russet nimbus about them, and over the intervening space was a tint of russet.

The Coalburgh chrysalids produced typical *Alope*, with broad yellow

bands, and like the females which laid the eggs. Therefore outside the belt of dimorphism *Alope* produced *Alope*, but inside the belt *Alope* produced *Nephele* and *Nephele* produced *Alope*.

In conclusion :

In Canada the typical *Nephele* is the only form representing the genus Satyrus, except that possibly in some localities *Alope* or intergrades may appear ; but if so, it is only occasionally. In New York and part of New England a belt of latitude is passed where in one section or other both these forms fly, besides an endless variety of intergrades. Finally, *Alope* emerges in the south from this belt as the only form, and inhabits a broad zone, which ends about with the southern line of North Carolina and of Tennessee, but at the southwest flies in parts of Texas, and has become slightly modified when compared with the *Alope* of the middle States. And to the west, somewhere between New York and Illinois, *Alope* disappears, and a slightly changed form of *Nephele* presents itself, and occupies the country to and on the eastern slopes of the Rocky Mountains. In some cases this cannot be distinguished from the typical *Nephele*, but as a whole, it has taken a departure, and has come to have differences in its larva and chrysalis. I call this form variety *Olympus* (after the companion of the satyr Marsyas when the latter had his little difficulty with Apollo).

The relationship between *Alope* and *Nephele* is in good degree paralleled by L. *Arthemis* and *Proserpina*, the first of which occupies the northern half of the Continent, but is dimorphic with the other in a belt of latitude which passes through the northern States from Maine to Wisconsin. *Proserpina* emerges from this belt on the south, and grades imperceptibly into *Ursula*, which last changes gradually till it has acquired a type, in Arizona, as different from that in which it manifests itself in Pennsylvania as the Texan *Alope* is from *Alope* of New York. This belt is nearly coterminous on both north and south with the belt of dimorphism in the Satyrids. It is worthy of note also that the dimorphism of P. *Turnus* begins inside this belt.

In this last-named species it has been supposed that the melanic form (confined to the female, *Glaucus*) first originated by accident, and was afterwards perpetuated and obtained an advantage over the yellow form, and finally in good degree supplanted it throughout its southern area, and that the existence of enemies had much to do with the suppression of one form, while their absence favored the other. What influence has

gradually transmuted *Alope* into *Nephele* it is difficult to conjecture. It could not here be the presence or absence of enemies which has affected one or other form. And if it is climatic, what can there be in common between the climate of Canada and Illinois which encourages *Nephele* and extinguishes *Alope*?

In a second paper I shall speak of *Pegala* and the Pacific species of this genus.

ENTOMOLOGY FOR BEGINNERS.

BY JAMES FLETCHER, OTTAWA, ONT.

Entomology seems to be gradually throwing off the veil of contempt under which it has been so long hidden. The Botanist has always to a certain extent been deemed a philosopher from the important part plants play in Pharmacy; the Geologist and Mineralogist, too, from the possibility of their discovering precious metals have been treated by the outside unscientific world as sages worthy of some respect. Entomologists, however, have not thus been honored by the masses. The question would be asked—What tangible results can come from collecting flies and bugs and sticking pins through them? and in vain the amount of damage done by insects year by year might be estimated and pointed out. This state of affairs though I believe is now at an end. The claims of the science on all agriculturists and horticulturists are daily becoming more apparent. The institution of the United States Entomological Commission, and the success that has attended that organization from the happy choice of such men as Messrs. C. V. Riley and A. S. Packard as directors, has perhaps done more than anything else to open people's eyes to the fact that after all there is something in Entomology. In Canada, too, much good work has been done. In 1868 two Entomological magazines were started, our own important organ, the CANADIAN ENTOMOLOGIST, in August, for Ontario; and *Le Naturaliste Canadien*, edited by the Abbé Provancher, in December, for Quebec: to these is chiefly due the progress the science has made in Canada. The Editors of the CANADIAN ENTOMOLOGIST—Rev. C. J. S. Bethune (1868–1873), and since that time our present

esteemed Editor—have always by their many charming and descriptive papers evinced a desire to make the study of Entomology as fascinating and easy as possible for beginners, while at the same time they have paid full respect to their scientific readers. *Le Naturaliste Canadien* is published in the French language. It was commenced in December, 1868, from which time the Abbé Provancher has fought bravely, and almost single-handed, against all obstacles, striving by its means to create among the French Canadians a love for the natural sciences, particularly Entomology. I am very sorry to see by the December number that on account of the grant which the Editor received from the Government having been discontinued, his valuable work may possibly be stopped; this would be a great pity, and every Entomologist ought to give a hand in helping him out of his difficulty. The magazine has been of great value to the farmers of Lower Canada, who in its pages have always received courteous answers on any subjects in the many branches of natural history affecting agriculture.

In the eleven volumes of the ENTOMOLOGIST now published, or in the Annual Reports of the Society, descriptions of nearly all the common Canadian insects, and illustrations of many of them, will be found. I would particularly call attention to a paper in the Annual Report of 1872 by Rev. C. J. S. Bethune, entitled "Beneficial Insects." This gives an outline sketch in a concise manner of the different divisions into which insects are divided and the distinguishing points of each.

With the above mentioned volumes and Dr. Packard's Guide to the Study of Insects, a very complete knowledge of the rudiments of Entomology can be obtained; the rest can only be learned by observation and experience in the field. Undoubtedly the first and most important step of all is to commence a collection. Study can only be carried on satisfactorily from the actual specimens, which should be examined alive whenever possible and full notes taken of any striking peculiarities observed; when preparing specimens for the cabinet, the one idea which has to be borne in mind, and upon which the whole value and beauty of the collection depends, is that they may appear natural, and a knowledge of how to effect this can only be attained by observing living specimens.

At the last annual meeting of the Society the importance of popularizing Entomology was discussed, and the Editor of the ENTOMOLOGIST kindly consented to give up some space every month entirely to popular Entomology, for the benefit of beginners and others who are unable to

study the science systematically; this step it was considered might materially increase the usefulness of our Society. It is proposed to have short papers on individual species, which will be illustrated whenever possible, and there will also be papers on the best modes of making and preserving collections. The work will be considerably facilitated if beginners will state any difficulties which they may encounter, for it is only by their mentioning their difficulties that the Editor can know how to assist them. Any questions which are of such a nature that they will be likely to assist others in their studies will be answered through the pages of the ENTOMOLOGIST when space admits.

THE CALOSOMAS OR CATERPILLAR-HUNTERS.

These insects belong to the Family called CARABIDÆ, which is a large and difficult Family to study, or even to define and limit exactly. The insects belonging to it are remarkable for their graceful forms, and at the same time for their cruel and predaceous habits, both in the larval and perfect states. It is this last trait which makes them such useful auxiliaries to the horticulturist.

Fig. 4.

The better known of the two represented here is called *Calosoma calidum*, Fabr., (fig. 4) or "The Glowing Beautiful-bodied Caterpillar-hunter." As an exception to the general rule, its English name is more formidable than the Latin; but so important a personage is its bearer that I will not deprive him of a single letter of his title, and indeed am almost tempted to add to it the words "most useful." It well merits its appellation, *Calosoma* (*Kalos* = beautiful, and *Soma* = a body). Fig. 4 gives a life-size representation of it. The color of the polished elytra or wing-covers is a deep blue-black, and the six rows of dots with which they are adorned are of a fiery burnished red, for which reason it has been called by the specific name of *calidum*. The legs in our figure are too thick and clumsy, but it must be well known to everyone. It may generally be found in early summer in damp pastures, either hidden under stones or running in the grass in search of caterpillars and other soft-bodied insects. Jaeger, who first called the members of this genus caterpillar-hunters, says "they may be found every morning and evening upon the branches of trees, looking out for caterpillars and

devouring them." They do not, however, restrict themselves to caterpillars, for they will attack and devour a perfect June-bug when fresh from the pupa state and soft, with apparently the same relish as their special dainty, a fat Cut-worm. In the larval state they are equally rapacious; they lurk in holes in the ground or under sticks and stones in the daytime, and only leave their retreats as night draws on to go in search of prey. Every spring I have several of these useful and luckily common beetles brought to me by kind friends who have found them in their gardens. To the enquiry, "Is this of any use to you?" I have always the answer ready, which somewhat surprises them: "No, but it is of particular use to you; take it carefully back and put it in your garden again; it is the best friend you have there, for it feeds entirely upon your enemies, the Wire-worms, Cut-worms and White-worms."

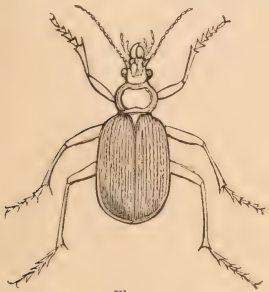

Fig. 5.

I am sure that through the agency of this beetle alone I have been able to gain more respect for the science of Entomology among horticulturists than from all the rest put together.

Much resembling this beetle in shape, but of a very much more striking appearance, is its near relative, *Calosoma scrutator*, Fabr., the "Beautiful-bodied Searcher," fig. 5. The color of its wing-covers is bright metallic green, garnished with longitudinal lines and sparsely punctured; round the margin runs an effective line of coppery-red. The head, thorax and legs are almost black; the margin of the thorax having a greenish tinge. The under side is of a deep burnished blue-green hue. Its habits are the same as those of *C. calidum*, but it is a much rarer insect. I have never seen a live specimen; but they are occasionally found in Ontario, and dead specimens are said to be frequently washed up on the outer shore of Toronto Island after a southerly gale.

Annual Report of the Entomological Society for the Year 1879.—The Annual Report of our Society for the past year is now nearly ready for issue. Members may expect to receive their copies within a few days.

THREE NEW SPECIES OF BOTIS.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

BOTIS OPPILALIS, n. sp.

♂ ♀. Allied to the *feudalis*, *s-linealis* group. Pale ochrey, opaque, powdered with deeper ochre and fuscous scales. Discal dots small, indistinct, orbicular a solid point, reniform an open ring. Lines acutely dentate. Outer line exserted opposite the cell, forming an inward tooth at vein 2, and again another at vein 1, on primaries. On hind wings the outer line runs evenly outward till over the median nervules, where it approaches the margin, then running inwardly and straight across to internal margin. This species wants the usual subcostal indentation of the outer line on secondaries. A terminal ochre line. Thorax deep ochrey. Beneath whitish; primaries shaded with ochrey superiorly; markings of upper surface faintly repeated. Fringes concolorous or a little paler than wings. *Expanse* 28 mil. Two specimens, Mass.; one male sent me by Prof. Peabody from Amherst, Mass.; Maine, Dr. Packard.

BOTIS OSCITALIS, n. s.

♂ ♀. Allied to the preceding, but both the discal marks are open. Opaque, ochrey, but more dusty, or fuscous tinted. Lines in lunulated thick scallops, not fine and dentate. Outer line forming three more exserted scallops over median nervules, strongly drawn in below median vein, with an outward projection below vein 2, else the lower part of the line is tolerably even. Hind wings paler than primaries with the outer line drawn in sub-costally and forming three exserted lunules over the median nervules, thence running inwardly and more evenly and faintly to internal margin. Fringes a little paler than the wing; terminal line obsolete. Head and thorax like fore wings. Beneath paler, with the pale fuscous markings repeated, slightly iridescent; body parts whitish. Labial palpi dark above, whitish beneath. *Expanse* 27 mil. Two specimens, Ohio, Mr. Dury; Maine, Dr. Packard.

BOTIS DISSECTALIS, n. s.

Allied to *marculenta*. Of the same bright yellow, shading to ochreous at base of primaries on costa and sides of the thorax in front. Ornamentation sub-obsolete. This species wants the subterminal line of

marculenta. Instead there is a vague and broad darker shade only visible with attention. The outer line is rounded outwardly over the median nervules, as in *trimaculalis*. It is apparently disconnected below vein 3, appearing again higher up below the open reniform and describing an inward curve above vein 1. The orbicular dot is imperceptible and the inner line very faint. Fringes faintly discolorous, being pale fuscous, concolorous with the lines. Hind wings very pale fuscous with a slight yellow cast. The line is continuous, squarely projected over median nervules, very different from allied forms. A pale terminal line before the pale fuscous fringes. Beneath largely washed with fuscous, legs outwardly white. On primaries the marking of the upper surface reappears relieved by pale interspaceal blotches; hind wings pale fuscous, uniform, with the line repeated. Palpi white beneath, dark at the sides. *Habitat*, Hamilton, Ontario, Mr. Moffat. The species seems a little stouter bodied than *marculenta*, of about the same expanse.

CORRESPONDENCE.

SWARMING OF ARCHIPPUS.

DEAR SIR,—

The assembling of *D. archippus* referred to in CAN. ENT. is perhaps not so frequently noticed as their passing over localities in flocks. Several years ago I saw them congregating in a bit of woods in the neighborhood of the city which I was visiting at the time. At least every other day they were hanging in a listless kind of manner to the underside of branches in immense numbers, with their wings closed, and not noticeable unless disturbed, very few being on the wing. Their favorite resting place seemed to be dead pine twigs, which would be drooping with their weight, and in more than one instance I saw one too many light and the twig snap, and send a dozen or more into the air to seek for another perch. In going to and from the woods I have seen several of them at once coming from different directions, high in the air, sailing along in their own easy and graceful way, all converging to the one spot. I did not see them depart. I went one day and could not find one in the woods; and as there were thousands, perhaps hundreds of thousands of them, it would have been a fine sight to see them go. The following year they were remarkably scarce and it was three years before they were even moderately plenty.

J. ALSTON MOFFAT, Hamilton, Ont.

SWARMING OF ARCHIPPUS.

DEAR SIR,—

I was surprised to learn from the letter of Mr. Edwards in your last issue, that the flocking of *archippus* is not a well known fact in Entomology, and in view of this I venture to add a few facts in regard to it which may be of interest.

While spending the winter of 1875–76 in Apalachicola, Florida, I found one of these *archippus* swarms in a pine grove not far from the town. The trees were literally festooned with butterflies within an area of about an acre, and they were clustered so thickly that the trees seemed to be covered with dead leaves; fig. 6 will enable the reader to form some idea of their appearance thus grouped. Upon shaking some of the trees a cloud of butterflies flew off, and the flapping of their wings was distinctly audible. They hung in rows (often double) on the lower dead branches, and in bunches on the needles. I find by my note book that visiting the flock towards evening, it was receiving additions every moment. I caught a net full off a bunch of dead needles, and, walking away to some distance and letting them go, all but three returned to the flock. The question as to where they came from seems a very interesting one. I was told by Dr. A. W. Chapman that there was hardly Milkweed enough in all Florida to produce one of these flocks, which doubtless do not confine themselves to Apalachicola. During my visit I found two more flocks not far from the first, but neither of these was as large. I should mention that I often observed examples among them *in coitu*.

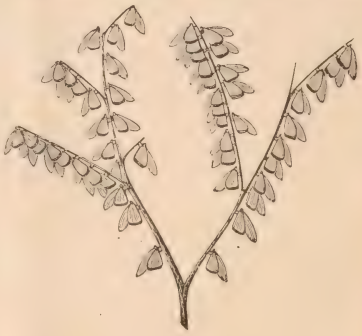

Fig. 6.

I have seen *archippus* flocking at the Isles of Shoals, N. H., towards evening, in very much the same manner, having flown nine miles from the mainland. I have also seen clusters of *Vanessa J-album* on tree trunks

at dusk in New Hampshire, which seemed to present a parallel to the *archippus* flocks, though of course on a very small scale.

R. THAXTER, Newtonville, Mass.

DEAR SIR,—

Last summer I discovered, unfortunately too late, that a large *Cossus* was working in some large and very old Oak trees near here. I hope next June or July to find out what it is, as I shall construct nets to envelop the tree trunks of several of these so infected Oaks. None of my correspondents have been able to give me light on the subject; they think it possible that this is a new species, and urge close observation, advice which I hope to be able to follow.

I also purchased five large trees of a coarse variety of Poplar, known here as Cottonwood, that were to be cut down, as they had commenced dying, "caused by a *grub* working in them." I found it to be a *Cossus* larva, but not as large as that working in the Oaks. Judging from a comparison of the empty pupæ cases found in them, which in these Poplars were very numerous, it is not the one described by Mr. Bailey in last January number as "*Cossus centerensis*," but seems more like *Xystus robiniae*. I had three of the trees cut down in order to obtain the pupæ; judge of my surprise and disappointment when my man came in, telling me he could find *none* but "lots of nasty *grubs*, of which he had given the near chickens probably a hundred or more," not thinking them valuable to me. I sent him back with instructions to preserve every larva he could find, and I now have about fifty in every stage of development from the half-inch beet red, the nearly two-inch long pink, to the about two and a half-inch long greenish-white larva. I have some in the wood in their own burrows, and have put the rest in sawdust; and I have ordered him to cut me pieces of that wood, bore some holes in the ends and put in the other larvæ, and cork it in, leaving a few air-holes; with these I hope to complete my observations in a warm room. I did not know before that these hybernated in the larval state, much less did I think they would be found of different moults.

A. H. MUNDT, Fairbury, Ills.

MIGRATION OF BUTTERFLIES.

DEAR SIR,—

I have received the following notes on migration of certain butterflies from Prof. J. E. Willet, of Macon, Ga., dated 19th Jan'y, 1880.

W. H. EDWARDS, Coalburgh, W. Va.

"I saw Callidryas *Eubule* passing here in great numbers during Sept., Oct. and Nov., 1878, from N. W. to S. E. About noon, when they were most abundant, there would be half a dozen visible all the time, crossing a 15-acre square of the city. They pursued an undeviating course, flying over and not around houses and other obstructions. They flew near the ground, and stopped occasionally to sip at conspicuous flowers. A geranium with scarlet flowers, and set in the open yard, attracted most that flew near it. Papers in Southern Georgia noticed the great numbers passing at different points; and a friend in Southern Alabama sent me specimens of the same, saying that they were subjects of speculation there. About March, 1879, there was a similar migration from S. E. to N. W., but in diminished numbers. I saw the fall migrations again Oct. and Nov., 1879, but in smaller numbers than in 1878. A lady of So. Georgia told me that her husband called her attention to the fall migration 26 years ago, and that she had observed it every year since. C. *Eubule* is found here in small numbers at other seasons of the year."

EARLY STAGES OF EPHEMERIDÆ.

The Rev. A. E. Eaton would like to communicate with anybody who would supply him with examples in fluid of nymphs of some of the American genera of Ephemeridæ. He would readily offer to pay a fair price for them and would defray their carriage to England. All that would be required would be five or six nearly full grown examples of one species per genus, put up in narrow tubes or narrow cylindrical bottles (one tube for each set), containing a solution of two parts of water to three of spirits about 60 over proof, well corked and with the cork tied down. Some tissue paper should be put into each tube with the specimens, to prevent the solid contents moving about within the tube when its position is shifted, care being taken not to compress the insects; and the tube should be filled up as nearly as possible with the fluid, to the exclusion of air bubbles. The tubes should be packed up with cotton, wool or tow, in a box, so that they shall be kept upright during the voyage; and this box should be packed into a stronger case with tow or hay or straw, and forwarded to Mr. Eaton by express, or through the agency of some bookseller, *not through the Post Office.* Address Rev. A. E. Eaton, 51 Park Road, Bromley, Kent, England.

The Canadian Entomologist.

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ALYPIA MACCULLOCHII, KIRBY.

BY WILLIAM COUPER, MONTREAL, P. Q.

On plate iv. of the "Fauna Boreali-Americana," Kirby gives a figure of the ♀ of the above species. In June, 1878, while collecting at the Godbout River, Lower St. Lawrence, I captured two males of this species, both on the same day. While *Alypia Langtonii*, Couper, were abundant in the same locality, no other specimens of *A. MacCullochii* were seen. I visited the place daily for a month in order to procure the female, but no more of either sex of the latter appeared. I therefore conclude it is a rare species on that coast. I am not aware that the male of *A. MacCullochii* has been hitherto described, and as it differs in some respects from Kirby's description of the female, it may be interesting to the readers of the CANADIAN ENTOMOLOGIST.

Alypia MacCullochii ♂.

Fig. 7—Upper Side.

Fig. 8—Under Side

Expansion of wings 1 inch. Wings and body black. Antennæ with numerous white rings, and gradually clubbed towards the apex. Orbit of eyes externally clothed with pale yellow hairs; four spots of same colored hairs on anterior portion of thorax, and a tuft of longer yellow hairs at base of primary wings. Legs mottled with white and yellow hairs. Primary wings with two, sometimes three spots in some specimens; the one near the base is cream-colored, divided longitudinally by a black line slightly forked where it approaches a small cream-colored spot which curves from the upper outside edge. The second is a transverse large white spot, traversed by five black lines dividing it into five, sometimes

six oblong spots; the same spots and lines are visible on the under side of the wings. There are two white spots on the secondaries; a triangular one near the base, divided by two or three black lines, and another transverse spot similar to, but smaller than that on the primary, also divided by black lines, making five or six oblong spots; the lowermost is only a small point.

The above remarks on the male, together with Kirby's description of the female, now published in No. 8, Vol. xi., CAN. ENT., will doubtless serve to make this rare *Alypia* better known. The illustrations were made by my esteemed brother entomologist, G. J. Bowles, of this city. The figures are so accurate that the student need not refer to the description. However, there being a distinction in the markings of the sexes, reference must be made to Kirby's description in order to determine them.

TWO NEW SPECIES OF ICHNEUMONIDÆ.

BY G. H. FRENCH, CARBONDALE, ILL.

MICROGASTER UTILIS, n. sp.

Length .11 of an inch. Head, thorax and abdomen of the males uniform black, the females the same with the exception that the under side of the second and third basal joints of the abdomen are tawny. Antennæ fuscous, somewhat rufous at base. Legs and feet tawny, rather pale, the knees of the hind pair dusky, the most so in the males. Wings hyaline; costa, stigma and veins fuscous, except the two extending from the substigmatal cells to the outer margin, which are hyaline. Ovipositor partially exserted. All parts of the body, wings and antennæ, moderately covered with a very short whitish pubescence, to be seen on the wing only with the aid of the microscope.

The cocoons are compact, except a little loose silk round the outside usually only partially surrounding the dense portion. When spun the most of them are detached from the caterpillar in which the larvæ have been parasites, and they are not placed together in any regular order.

Described from 11 males and 4 females reared from the larva of *Sphinx (Macrosila) Carolina*, and 5 males and 7 females reared from a larva of a species of *Leucania*.

MACROCENTUS IRIDESCENS, n. sp.

Length .13 of an inch. Head piceous, the mouth parts, including the clypeus, tawny; antennæ rufo-cinereous, the basal joint yellowish. Thorax light rufous, darkest on posterior part, paler beneath; wings hyaline with strong iridescence, the veins, costa and stigma fuscous; feet and legs straw color, the last tarsi of hind feet a little darker. Abdomen rather slender, rufo-piceous, under side of middle joints slightly tawny; ovipositor not exserted. Under the microscope a fine grayish pubescence is seen on all parts of the insect, sparse on the abdomen and legs, but profuse on the antennæ and wings, not interfering with the iridescence on the latter. Pupa with the host.

Described from 5 males and 7 females reared from two larvæ from an elm tree, that were taken to be *Eugonia subsignaria*.

I wish to acknowledge here my indebtedness to E. T. Cresson, of Philadelphia, for generic determination of these species, and for other valuable information and suggestions.

ON THE EARLY STAGES OF SOME MOTHS.

BY D. W. COQUILLETT, WOODSTOCK, ILL.

In the following descriptions I have made use of certain terms which will need explaining. The subdorsal line is midway between the dorsal line and the spiracles; the stigmatal line includes the spiracles; the subdorsal space lies between the dorsal and subdorsal lines; the stigmatal space is between the subdorsal line and the spiracles.

The moths of the following larvæ were determined for me by Mr. A. R. Grote.

The first larva described below is provided with only 14 legs; all of the others have 16 legs.

HYPENA SCABRA, Fabricius.—Body green; a dark green dorsal line, faintly edged with white; a white subdorsal and stigmatal line; venter pale green; head smooth, green; length 1 inch. Feeds on clover; July 1 to September 10. Enters the earth to pupate.

Mr. Grote writes me that the moth into which this larva is finally transformed is the *Hypena humuli* of Harris; but the larva which Harris described as *H. humuli* is that of the moth *Hypena evanidalis* of Robinson.

CALPE CANADENSIS, Bethune.—Body bluish white; a stigmatal yellow stripe; a dorsal row of transverse black dashes; a row of transverse black dashes just above the yellow stigmatal stripe; some of the black dashes in this row unite with some of those in the dorsal row, forming transverse black bands; venter black, or deep green; thoracic legs brown, the others black; head shining yellow, marked with two black spots on upper part of face, three black spots near the jaws, and a black spot on each side of the head; length 1¼ inches. Feeds on Meadow-rue (*Thalictrum*). April 20 to August 10. Spins a cocoon.

PSEUDOGLOSSA LUBRICALIS, Geyer.—Body dull purplish brown; on the back are two rows of alternate black and yellow tubercles, the black ones situated on the anterior part of the segment; the tip of each tubercle is bent over at nearly right angles, the tips of the black ones being bent backward, and those of the yellow ones forward; some of the black tubercles are ringed with yellow at the base; on the sides of the body are a few piliferous spots, each giving rise to a short bristle; head dirty blackish; length ⅞ inch. Feeds on grass. Usually found beneath pieces of wood lying upon the ground. June 15 to July 20. Spins a cocoon.

SCEPSIS FULVICOLLIS, Hübner.—A dark colored dorsal line, then a pale greenish stripe on which is a row of small warts; next to this stripe is a pink line, then a pale yellow line, then a dark greenish, slate-colored stripe on which is a row of small warts; the spiracles are situated on the lower part of this stripe, below the warts; below this stripe is a pale yellow line; between this line and the legs are two rows of small warts; from each of the above warts proceeds a thin, spreading cluster of whitish hairs; venter pale greenish-yellow; head shining yellow; length 1 inch. Feeds on grass; June 15 to August 1. Spins a cocoon.

CHYTOLITA MORBIDALIS, Gueneé.—Body somewhat flattened beneath and broadly convex above, reddish, mottled with yellow; a dark colored dorsal line; segment 1st darker than the others, dotted with black; on each side of each of the segments 2 and 3 are seven piliferous spots, the first four arranged transversely, the next two obliquely, the lowest one

singly ; on each side of each of the segments from 4 to 9 inclusive are eight piliferous spots, the first two arranged obliquely, the next three in a curved transverse row, the lowest three in the form of a triangle ; one of these spots is sometimes wanting ; head small, dark flesh or grayish ; length 7/8 inch. Feeds on grass and the leaves of Hazel. April 1 to May 5, and June 1 to July 20. Spins a cocoon.

Hypoprepia fucosa, Hübner.—Body dark reddish-brown, or brownish-black ; a dorsal, stigmatal, and indistinct subdorsal yellow line ; stigmatal space mottled with yellow ; warts black, and from each proceeds one or two stiff black bristles ; head brownish-black, with a few short whitish hairs on the face ; length 5/8 inch. Feeds upon the moss, etc., which grows on Oak trees. May 15 to July 1, and August 1 to September 15. Spins a cocoon.

Parorgyia Clintonii, Grote and Robs.—Body dark gray ; on top of each of the segments 4, 5, 6 and 7 is a wide tussock of mouse-colored hair, sprinkled with white ; on each side of the first and last segments, and on top of segment 11, is a pencil of long black hairs which are knobbed at the outer end ; on top of segments 9 and 10 is a small reddish wart ; hair on sides of body quite long, mouse-colored ; head shining black ; length 1 1/4 inches. Found on Oak trees, May 20 to July 1. Spins a cocoon.

Botis penitalis, Grote.—Body pale yellow ; on each side of segment 1 are two black piliferous spots ; on each side of segments 2 and 3 are five black piliferous spots, the first two arranged transversely, the next two longitudinally, the last one singly ; on each side of each segment from 4 to 11 inclusive are five black piliferous spots, the first two arranged obliquely, the other three in a curved transverse row ; below the lowest of these is sometimes an additional piliferous spot ; cervical shield brownish, or white dotted with black ; venter whitish ; head whitish, dotted and marked with black ; length 5/8 inch. Feeds on Indian Hemp *(Apocynum cannabinum)*. Lives in a nest of leaves which are fastened together with silken threads. June 20 to August 1, and August 20 to October 1. Assumes the chrysalis form in its nest.

Arsilonche Henrici, Grote.—A black dorsal stripe dotted with white, then a yellow stripe, then a pale yellow stripe dotted with white ; the spiracles are situated on the lower part of this stripe ; below this stripe

is a pale yellow line ; on each side of each segment are about six deep yellow warts, from each of which proceeds a thin spreading cluster of blackish hairs ; venter dark colored ; head black, dotted with white, with two white streaks on top, and a yellow v-shaped mark on the face ; length 1½ inches. Feeds on Smartweed *(Polygonum)*. June 1 to July 10, and August 20 to October 1. Spins a cocoon.

I should like to request those persons who intend to publish descriptions of larvæ to always give the number of legs with which the larva is provided ; and also to give the location of the lines or spots with which the larva is marked—that is, to state whether they are dorsal, subdorsal or stigmatal, or whether they are on the subdorsal or stigmatal space.

A LIST OF DIURNAL LEPIDOPTERA INHABITING THE STATE OF ILLINOIS.

BY C. E. WORTHINGTON, CHICAGO, ILL.

The following list is furnished in compliance with the request of the Editor of the CANADIAN ENTOMOLOGIST, published some time ago, some unsettled questions regarding species and distribution having delayed its preparation from time to time.

The list is intended to be as complete as possible, and to include all described species known to have been taken within the State limits, or so nearly adjacent thereto as to certainly belong to the Illinois Fauna.

In order to roughly designate the distribution within the State I have attached an * to all species from the northern portion, of whose capture I have personal knowledge, and have further affixed a † to such species as are not known to occur in the southern portion of the State.

Several species of *Pamphila*, viz., *Pamphila pontiac, dion, hianna, bimacula, pottawattomie* and *ursa*, appear to be limited to the north-east corner of the State, *Chrysophanus dione* and several northern forms to the north-west portion, and presumably *Agraulis vanillæ* and other southern forms are merely occasional visitors to the extreme southern end.

I have refrained from including *Pamphila uncas, Amblyscirtes vialis* and *Pyrgus centaureæ*, which doubtless belong to our Fauna, and are likely to be taken when the proper localities are fully explored.

I have further omitted *Thecla augustus*, *Chrysophanus epixanthe*, *Lycaena lucia* and *Grapta gracilis* of former lists, for want of authentication, and because, in my judgment, they are unlikely visitors. These genera are specially confusing to amateurs, and it is not unlikely that some allied species may have been mistaken for these.

I acknowledge assistance of value from Messrs. W. H. Edwards, Geo. H. French and Thos. E. Bean, who have aided me much in the preparation of this list.

PAPILIO, L.

Ajax, L.
* dim. var. Walshii, Edw.
* " Telamonides, Feld.
* " Marcellus, Bd.-Lec.
*Philenor, Cram.
*Asterias, Fab.
*Troilus, L.
*Turnus, L.
* dim. var. ♀ Glaucus, L.
*Cresphontes, Cram.

PIERIS, Schrank.

*Protodice, Bd.
* dim. var. Vernalis, Edw.
†*Oleracea, Bd.
Virginiensis, Edw.
*Rapæ, L.

NATHALIS, Bd.

Iole, Bd.

ANTHOCARIS, Bd.

†*Olympia, Edw.
Genutia, Bd.

CALLIDRYAS, Bd.

*Eubule, L.
Sennæ, L.
Philea, L.

COLIAS, F.

*Caesonia, Stoll.
*Eurytheme, Bd.
* dim. var. Keewaydin, Edw.

COLIAS, F.

*Philodice, Godt.

TERIAS, Swain.

*Lisa, Bd.
*Nicippe, Cram.

DANAIS, Latr.

*Archippus, F.

AGRAULIS, Blanch.

Vanillæ, L.

ARGYNNIS, F.

†*Idalia, Drury.
*Cybele, F.
*Aphrodite, F.
†*Alcestis, Edw.
†*Atlantis, Edw.
†*Myrina, Cram.
†*Bellona, F.
Diana, Cram.

EUPTOIETA, Doub.

*Claudia, Cram.

MELITAEA, Fab.

Phaeton, Drury.

PHYCIODES, Doub.

*Harrisii, Scud.
*Nycteis, Doub.
Carlota, Reak.
Tharos, Drury.
* dim. var. Marcia, Edw.
* " Morpheus, F.

GRAPTA, Kirby.

Interrogationis, F.
* dim. var. Umbrosa, Lint.
* " Fabricii, Edw.
Comma, Harr.
* dim. var. Harrisii, Edw.
* " Dryas, Edw.
Faunus, Edw.
*Progne, Cram.
*J-Album, Bd.

VANESSA, F.

*Antiopa, W.
† Milberti, Godt.

PYRAMEIS.

*Atalanta, L.
*Huntera, Drury.
*Cardui, L.

JUNONIA, Doub.

*Lavinia, Cram.

LIMENITIS, F.

*Ursula, F.
†*Arthemis, Drury.
† dim. var. Proserpina, Edw.
*Dissippus, Godt.

APATURA, F.

Celtis, Bd.
Clyton, Bd.

PAPHIA, West.

Audria, Scud.

NEONYMPHA, West.

*Eurytris, F.
Sosybius, F.
*Canthus, L.
Gemma, Hüb.

DEBIS, West.

*Portlandia, F.

SATYRUS, West.

Alope, Bd.
dim. var. Alope, Bd.
* " Olympus, Edw.

LIBYTHEA, F.

*Bachmanni, Kirt.

CHARIS, West.

*Borealis, Gr.-Rob.

THECLA, F.

M-album, Bd.-Lec.
*Humuli, Harr.
Strigosa, Harr.
*Calanus, Hüb.
*Edwardsii, Saund.
*Acadica, Edw.
Smilacis, Bd.
Poeas, Hüb.
Irus, Godt.
Niphon, Hüb.
*Titus, F.

FENISECA, Grote.

Tarquinius, F.

CHRYSOPHANUS, Doub.

† Dione, Scud.
*Thoe, Bd. Lec.
*Americana, D'Urban.

LYCAENA, F.

Lygdamas, Doub.
†*Scudderii, Edw.
Pseudargiolus, Bd.-Lec.
* dim. var. Pseudargiolus, B.-L.
* " Neglecta, Edw.
* " Violacea, Edw.
*Comyntas, Godt.

ANCYLOXYPHA, Feld.

*Numitor, F.

THYMELICUS, Speyer.

†*Garita, Reak.

PAMPHILA, Fab.
†*Massassoit, Scud.
†*Ursa.[1]
*Zabulon, Bd.-Lec.
*Sassacus, Scud.
Leonardus, Harr.
*Huron, Edw.
Phylaeus, Drury.
†*Pontiac, Edw.
†*Dion, Edw.
Egeremet, Scud.
*Peckius, Kirby.
*Mystic, Edw.
*Cernes, Bd.-Lec.
Manataaqua, Scud.
*Metacomet, Harr.
Verna, Edw.
†*Bimacula, Gr.-Rob.
Viator, Edw.
Vitellius, Sm.-Abb.
*Delaware, Edw.
†*Hianna, Edw.

PAMPHILA, Fab.
†*Pottawattomie.[2]

AMBLYSCIRTES, Speyer.
Vialis, Edw.
Samoset, Scud.

PYRGUS, West.
Tessellata, Scud.

THANAOS, Bd.
*Brizo, Bd.
*Icelus, Lint.
*Lucilius, Lint.
*Persius, Scud.
*Martialis, Scud.
*Juvenalis, F.

PHOLISORA, Speyer.
*Catullus, Cram.
*Hayhurstii, Edw.

EUDAMUS, Swain.
*Pylades, Scud.
*Bathyllus, Sm.-Abb.
*Lycidas, Sm.-Abb.
*Tityrus, F.

1. PAMPHILA URSA, n. s.

Description, Female—Above dark brown, head, thorax and abdomen concolorous. Primaries with three minute yellowish interspaceal dots in line, the anterior one adjacent to costa at about one-fourth of its length from apex; two larger yellowish spots about the middle of wing on outer edge of disc. Secondaries with a row of elongate paler spots crossing discal space on veins; fringes of all wings conspicuous and purplish.

Beneath paler than above, with a purplish lustre, all spots re-appearing with more distinctness, veins slightly paler than spaces, the minute spots and the row of spots on secondaries distinctly visible. The elongate spots on secondaries above very indistinct and fairly visible only in certain lights.

Lake Co., Ind., near Ills. line, 2 females, July, 1879. Expands 32 cm. Allied in shape of wings and antennæ to *P. massassoit;* differs strikingly from any form known to me, and readily recognizable by the

purplish lustre of inferior surfaces. I have included this in the foregoing list, as it was taken very close to the line and undoubtedly belongs to our Fauna.

2. PAMPHILA POTTAWATTOMIE. n. s.

Description, Female—Above dark brown, head, thorax and abdomen concolorous; primaries with seven yellowish translucent spots arranged as follows: three small oblong interspaceal spots in line, anterior one adjacent to costa at about one-fourth its length from apex; nearly in a line between apex and middle of inner edge of wing three more, the first small and indistinct, nearly behind the posterior oblong spot, the second larger, saggitate, the base outward, the third and posterior one irregularly quadrangular, much larger than the second; near the costal angle of this a smaller quadrangulate spot. All translucent spots bordered more or less with brassy scales having a metallic lustre. Near middle of inner edge a nearly lunate spot, opaque, consisting of brassy scales.

Beneath slightly paler than above, all spots re-appearing except the opaque lunate spot, which is represented by a pale shade bounded by the divergent veins and extending nearly to margin.

Spots on secondaries above and below very faint and distinctly visible only in certain lights. Expands 34 cm.

From the neighborhood of the Chicago massacre, Cook Co., Ill., and Lake Co., Ind., July, 1879: 3 females. Allied to *otho;* may be recognized by its smaller size and greater number of spots, and by the translucency and brassy edges of spots.

ON THE NEURATION OF EUSTROTIA SECTA.

BY A. R. GROTE, BUFFALO, N. Y.

EUSTROTIA SECTA Grote, CAN. ENT., xi., 199.

This species, which is frail and wide-winged, has much the appearance of a *Thalpochares*, but the primaries have an accessory cell. The fore wings are 12-veined, 8 out of 7, 9 out of 8, 7 out of the extremity of accessory cell, running for more than a quarter of its length before it throws off 8. Hind wings 8-veined with vein 5 equally strong. Discal cell open on both wings. A fuscous species washed with whitish, with the narrow median space brownish and an internal patch containing black scales on the margin. Massachusetts.

ON CERTAIN SPECIES OF SATYRUS.

BY W. H. EDWARDS, COALBURGH, W. VA.

(Continued from Page 32.)

PEGALA.—At the extreme south, and restricted principally to the southern part of the Gulf States and Florida, this species appears. Fabricius described it in 1775, in Syst. Ent.; says it is fuscous, the fore wing with a rufous (rufa) band and a single ocellus; the hind wing with a single ocellus above, 6 below, with ferruginous irides and white pupils. Although the single ocellus on fore wing is one of the principal characteristics of *Pegala*, both ocelli are occasionally found in the female, and more often the second ocellus is represented in both sexes by a black dot or a small round spot. One of these two-eyed examples seems to be figured in Boisduval and LeConte, after Abbot, for *Alope*. Dr. Boisduval says in the text that he regards *Pegala* as a one-eyed variety of *Alope*, and I think he has given a two-eyed *Pegala* for *Alope* in his plate. The larva is represented as having one broad and one narrow white band, the intervening space being gray. This is considerably unlike *Alope*, which has one yellow band over the feet, and no gray at all, all the surface being green. The chrysalis of the plate has two ocellar prominences, while the head case of *Alope* is truncated and rounded, with no prominences.

I was informed by Mr. James Ridings, who collected one season in Georgia, some years ago, that in its habits *Pegala* differed considerably from *Alope*, flying in the pine forests and alighting on the bark of trees. When disturbed it would fly about for a while and eventually return to the same spot. It seemed to him to resemble Debis *Portlandia* in habits rather than the species of its own genus. Mr. W. H. Ashmead, of Jacksonville, Fla., writes me: "*Pegala* is quite common in hummocks, along fences and in the outskirts of forest, from about the middle of July to October. When chased they fly high *and alight on the side of a tree, and are seldom seen in open fields.*" Dr. A. W. Chapman writes: "*Pegala* is or was common in the open pine woods back of this city (Apalachicola). It seemed to like a hot sandy exposure, but I never saw one in my garden or in the fields. They always alight on the naked bodies of the pines with head up, down, or sideways." I cannot learn that *Pegala* and *Alope* fly in the same localities or even in the same districts. There appears to be a belt in the cotton States, or from Georgia to Mississippi at

least, in which *Alope* is unknown, and beyond the northern border of which it does not pass. And while *Pegala* may here and there inhabit this belt, it is not common except to the south of the belt, or in the country adjacent to the Gulf, and in Florida. How far to the northward along the Atlantic coast it flies I am not advised, but perhaps as far as Virginia. It inhabits St. Simon's Island, Ga.

A single diminutive (as if from a starved caterpillar) *Pegala* ♂ has been sent me by Prof. Lewis R. Gibbes, of Charleston, S. C., which was taken some ten years ago on the line of the Charleston & Augusta R. R., 60 or 70 miles inland ; and Prof. Gibbes states that he has had two or three other examples in his collection, one of which he believes was taken at Charleston. He also sent me an *Alope*, which with a few others was taken Sept., 1878, in S. C., about 25 miles inland. Evidently *Pegala* is rare about Charleston. Rev. Dr. Jno. G. Morris tells me that he has never known of *Pegala* being taken along the coast of Maryland or of Virginia. Prof. Riley has made inquiries of entomologists in Washington, and all agree that the species is unknown there. There are so very few collectors of butterflies along the Atlantic coast from Georgia to New Jersey that only scanty information can be obtained on this subject. A single male, of the Florida type, was taken by Mr. Laitloff, near Jersey City, and kindly sent to me for inspection ; but I can hear of no other having been taken or seen in the Middle States. I believe *Pegala* and *Alope* are kept apart by the nature of their food plants. *Alope* feeds on meadow grasses, which not being found in the cotton belt, the species is checked. On the other hand, the coarse grasses which grow along the Gulf and in Florida, and along the sea coast, must form the food of *Pegala*. The two species could come together only by accident, as after a storm ; or the eggs or larvæ might be transported artificially. I have taken the semi-tropical species, Sphinx *Ello*, in the Catskill Mountains, and many butterflies which live in the Gulf States have occasionally been taken on Long Island, and along the coast of New England. Jersey City is close to the salt meadows, and the grasses which flourish thereon would be allied to those of the southern coast, and be the proper food of *Pegala*. Mr. Ashmead says : " I have never seen or heard of *Alope* being taken in Florida, nor do I think it is found here." Prof. J. E. Willet, of Macon, Ga., informs me that he has neither *Alope* nor *Pegala* in his collection, which is a local one, and does not know of them in his district. Mr. Chas. T. Jameson writes from Oxford, Northern Miss. : " I have not seen

Alope in this State. *Pegala* flies in some portions, but rarely. I do not think *Alope* is found here." The late Dr. O. C. Sparrow resided some time at Valdasta, Lowndes Co., Southern Georgia, and sent me thence several examples of *Pegala*. He wrote 13th July, 1877: "I have never taken *Alope* here." On 7th Aug. he says: "I have seen a good many *Pegala*. In a stroll to-day I took 3 males." Dr. Chapman says: "I have never seen *Alope* anywhere in the south. Our grasses here are all hard and coarse, and we have no cultivated ones like the Blue grass, Red-top, English grass, &c. The kinds of grass which grow here in the pine woods are found in nearly all the States which have what we call the 'pine-barrens.'"

Messrs. Boll and Belfrage, professional collectors, long resident in Texas, can give me no information about *Pegala*. Mr. Belfrage writes: "It is not found in Bosque Co., and so far as I can remember, I have not seen it in Texas. *Alope* is common in my locality." Mr. Heiligbrodt, at Bastrop, Texas, says that *Alope* at times has been common, but he does not know *Pegala*. Mr. Otto Meske tells me, however, that in 1876 he received a *Pegala* male from Bastrop, the only one he ever saw from Texas.

Not only therefore do I find no evidence that *Pegala* and *Alope* fly (i. e. habitually) in the same districts, but there are no intergrades forthcoming. There are no doubtful examples as in the case of *Alope* and *Nephele* in the belt of dimorphism before spoken of. If they were varieties of one species as some have asserted, or forms of one species, there would be a belt of territory inhabited by the typical forms and all manner of intergrades. On the contrary, there is a belt which separates these forms and is in effect inhabited by neither. The distinction between the two is as clear as between some unquestioned species in almost every genus of butterflies. They are separated by their markings, their habits, and by the food of their larvæ. Also, according to Abbot, if the figures in Bois. and Lec. were drawn from *Pegala*, as supposed, by differences in larvæ and very important differences in chrysalids.

There are in my own collection and in those of friends to whom I have written, 29 examples of *Pegala*, 21 ♂, 8 ♀. Of these males, 14 have one ocellus on fore wing, 6 have one ocellus and a black dot, 2 have one ocellus and a small black spot. Of the 8 ♀, 5 have one ocellus, 1 has one and a small spot, 2 have two complete pupilled ocelli.

Of 21 ♂, 17 have 6 ocelli beneath the hind wing, 3 have 5, and 1 has 5 on one wing and 6 on the other.

Of 8 ♀, 6 have 6 ocelli, 1 has 5, 1 has 5 on one wing and 6 on the other.

Every one of both sexes has a small ocellus at inner angle of hind wing, on upper side.

The uniformity of these characters—the ocellus at inner angle always present, and the number of small ocelli, which are scarcely ever less than 6 and never below 5—in so many examples brought together from various quarters contrasts strikingly with the great variability of *Alope* and *Nephele* in the same points.

Besides these eastern forms are others allied to them from the far west. On the eastern side of the Rocky Mountains the Illinois type seems to prevail. I have received it from Montana, Colorado and New Mexico. On the Pacific side we have *Boopis* Behr, 1864, *Ariane* Bois., 1852, *Paulus* Edw., 1879, *Gabbii* Edw., 1870, and *Wheeleri* Edw., 1873.

Boopis.—Dr. Behr, Proc. Cal. Acad. Sci., 1864, distinguished *Boopis* from *Nephele* by the absence of ocelli on under side of hind wings. The male is dark brown and the ocelli on fore wings have nearly always a yellowish ring, often faint. In the female this ring is enlarged and sometimes the field is yellow tinted. I have one example in which it is nearly clear yellow, and makes a broad clouded band. So far it approaches *Alope*. Of 5 ♂, 4 have 2 obsolescent ocelli beneath hind wings, 1 has 1. Of 7 ♀, 1 has 3, 5 have 2, 1 has 1. Undoubtedly some *Nephele* females are closely like *Boopis* ♀, if not undistinguishable from it, but the difference between the males is more marked, one showing a full complement of small ocelli in most cases, and less than four very rarely, the other never reaching four so far as I am aware. *Boopis* flies from Arizona to British Columbia.

Paulus.—This species stands midway between the two groups into which the American species of this genus may be divided, the lesser group comprising *Phocus*, *Silvestris* (*Oetus* Bois.), *Meadii* and *Charon*. I described *Paulus* from 2 ♂, 1 ♀ taken by Mr. Morrison in Nevada, 1878, but have since received a ♀ from Mr. Graef, taken in Utah, and a ♂ taken at Soda Springs by Mr. Behrens, and 1 ♂, 1 ♀ from Olympia, from Mr. Morrison. I have also recently received a fine series of perfect examples of *Silvestris*, taken by Mr. Baron in Northern Cal., and some of

these are of larger size, especially in the female, than any I have before seen. Placed by the side of *Silvestris*, *Paulus* resembles it closely in both sexes, as to upper side, but the male lacks the black sexual dash which is characteristic of *Silvestris*. Both species have about the same expanse of wing, the ♂ of *Paulus* measuring 1.75 inch, the ♀ 1.8 in. The males are black-brown, the females are lighter by several shades. The former have two black spots on fore wing, small and unpupilled except in one instance, there being then a white dot on the anterior spot. On neither is there a spot at anal angle. The females have two large ocelli, in yellow rings and with white pupils. One has a complete ocellus at anal angle, the other nothing. On under side the males have a yellow tint, and are suffused with gray, especially noticeable on the outer half of each wing. The females are decidedly whitish-gray, and the black edges of the discal band on hind wing are very clear on this light ground. The outer edge of the band takes nearly the same course as in *Ariane* in the males, and in one female, but in the other it is cut up by small crenations, quite unlike any example of *Ariane* I have seen. The ocelli are normally six, but in nearly every case are partly obsolete, only brown patches indicating them; the Utah ♀ has 5 black spots varying in size, each with white pupil. In *Silvestris* the outline of the discal band is different, there being long jaws projected at cell, with a deep and narrow sinus between them. So it is with the other members of the *Silvestris* group, and this peculiarity forms a good character for the division of the genus. The ocelli also in *Silvestris* are never complete, at most only white dots inside a few black scales, and usually these are wanting. (Until I received Mr. Behrens' examples of *Silvestris*, I had supposed *Octus* Bois. to be a distinct species, with naturally obsolescent markings on under side. This is the character of Dr. Boisduval's type, which I have, and Mr. Henry Edwards has assured me that he never has seen specimens which were otherwise. But those sent me by him were all worn, as is the type. The fresh examples sent by Mr. Baron make it plain that *Octus* is only a worn and faded *Silvestris*).

(To be Continued.)

CONTRIBUTION TO THE COLLECTIONS OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.—Mr. V. T. Chambers, of Covington, Kentucky, has kindly donated to our Society two boxes of named Tineids, chiefly from Texas and Kentucky, many of them with their gold and silver deckings perfect gems. We are greatly indebted to Mr. Chambers for this generous gift.

ENTOMOLOGY FOR BEGINNERS.

The Common Woolly Bear (Spilosoma virginica).

BY THE EDITOR.

The caterpillars known under the common name of "woolly bears" belong to the family of Arctians, and most of the species in the moth state are very pretty objects. The commonest of all the species is *Spilosoma virginica*, a pure white moth which appears on the wing in May, when it deposits its clusters of round yellow eggs on the under side of the leaves of many plants. In a few days these hatch into minute hairy caterpillars, which for a time feed in company and devour at first the under side of the leaf only so that it assumes a scorched and withered aspect. In a short time, however, they part company, each one choosing his own course, and blessed with good digestive powers, they eat freely of all parts of the leaf. The full grown caterpillar (fig. 9, *a*) is nearly two inches long, thickly clothed with hair usually of a yellowish color, but not always so, for some are light brown and others a darker brown. The head and feet are usually yellow, and the hairs arise in little tufts from small yellow tubercles arranged nearly in rows across the body. In the spaces between the segments there are darker lines, sometimes brown or dark brown, and occasionally nearly black; there is a dark line along each side, and the under surface is also of a dark shade.

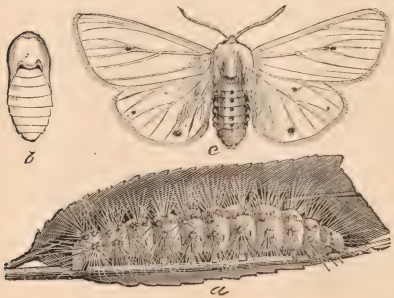

Fig. 9.

When full grown the caterpillar seeks some sheltered nook in which to change to a chrysalis, attached to the under side of a board, under the bark of a tree or in some crevice in a fence, wherever it is dry and secluded. Having fixed on a suitable locality, the larva proceeds to divest its body of the covering of hairs, and with these woven together with

silken threads, it constructs the slight cocoon which is to shelter the chrysalis, and here in a short time the change takes place. From the chrysalis (*b*. fig. 9), which is of the usual brown color, in a week or two the perfect moth appears, soon to deposit fresh patches of eggs, from which in a few days the second brood of larvæ are hatched, which attain maturity and enter the chrysalis state before winter comes, and remain in this quiescent condition until the following spring.

The moth (fig. 9, *c*) measures when its wings are expanded from one inch and a half to two inches. The figure represents a female ; the males are somewhat smaller. Both sexes have the wings snowy white with a few black dots which vary much in number in different specimens ; in some there are two on each front wing and three on each hind wing, as in the figure, while in others the spots are almost wanting, and there is every gradation between these extremes. On the under side the spots are more distinct than on the upper, and sometimes the white surface is slightly tinged with yellow. The antennæ are white above, dark brown below, the head and thorax white. The abdomen is orange colored, sometimes streaked across with white, and has three rows of black spots, one above and one on each side ; the under side of the abdomen is white, sometimes tinged with orange.

This species is attacked by several parasites, which destroy immense numbers every year ; were it not for this we should soon be overrun with them.

ON THE DESCRIBED N. AM. SPECIES OF THALPOCHARES.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

THALPOCHARES PATRUELIS Grote, CAN. ENT., viii., 27.

The fore wings are 12-veined, no accessory cell, 9, 10 out of 8, costal nervules rather crowded, cell open. Hind wings 8-veined, vein 5 a little weaker than the rest, independent. This little species, of which I have both sexes, is rusty ochrey, the hind wings sub-pellucid, washed with

ochrey externally. The fore wings are pale ochrey with an oblique whitish stripe, bordered by rusty ochreous, running from just before apices to internal margin at about the middle. The costa is straight, apices pointed. Alabama and Texas (v. Meske). This species is referred to *Thalpochares* in Check List, ii., 46.

It seems probable that *Tarache patula* Morr. belongs to *Thalpochares*. It must resemble *patruelis*, but cannot be the same since it is described as having "broad oblique ferruginous fasciæ, the first fascia extends from the inner margin, about one-third of the distance from the base to the inner angle, to the apex, it gradually decreases in breadth and at the apex becomes linear: the second fascia extends from a point on the inner margin, about two-thirds of the distance from the base to the inner angle, to the apex; it is of nearly equal breadth throughout." In *patruelis* the usual lines are obsolete or hardly to be made out, and a single pale oblique fascia, lined outwardly with a dusky ochrey or rusty shade, extends from near apices to internal margin at within the middle. The oblique stripe runs at variance with and crosses the posterior line, which latter, with the anterior line, is fine, even, and more or less discernible. These fine lines are both slightly inwardly oblique, pale and dark. The general color inclines to pale ochreous, the wing shaded exteriorly more or less with reddish or rusty. The Alabama specimen is more reddish and a little larger than the Texas material before me. In Mr. Morrison's description of the "posterior wings" there is a confusion with the "anterior wings" which makes his remarks unintelligible.

I regard *patruelis* as structurally a typical *Thalpochares*, while Mr. Morrison seems to "hesitate to found a new genus" for *patula*. But one ground for the probable affinity of the two species is the fact that they were both described under *Tarache*, and referred there provisionally. While there can be no doubt that the species are distinct, from the opposing characters of ornamentation given in the descriptions, there seems to me sufficient reason for referring *patula* to *Thalpochares*, rather than leaving it in *Tarache*, where it is out of place according to its describer.

The following is a list of our described North American species of *Thalpochares*:

carmelita Morr., Proc. Acad. N. S. Phil., 1875, 434, Texas.
elegantula Harvey, Can. Ent., viii., 55, - Nevada.

arizonæ Hy. Edw., Proc. Cal. Acad., 1878,	Arizona.
aetheria Grote, N. Am. Ent., I., 47,	Florida.
patruelis Grote, Can. Ent., viii., 27,	Ala., Texas.
patula Morr., Proc. Ac. N. S. Phil., 1875, 69,	Texas.
mundula Zeller, Beitr., 1, 14, Tab. 2, fig. 4,	Texas.
orba Grote, Can. Ent., ix, 68,	Alabama.

Of these species I have only been able to examine the neuration of *aetheria* and *patruelis*, from want of material. Three of them, *patula*, *elegantula* and *arizonæ*, are not represented in my collection. *Aetheria* and *patruelis* agree in having no accessory cell, but differ by veins 8 and 7 being separate in *patruelis*. Whereas in *aetheria* 8 springs from 7 and 9 from 8, in *patruelis* 9 springs from 8 and 10 from 9. Prof. Zeller seems somewhat uncertain as to whether *mundula* can remain under *Thalpochares*, and I am equally so with regard to *orba* until I can obtain more material from which to study the neuration, which is a guide in this and allied genera.

CORRESPONDENCE.

DEAR SIR,—

It may be of interest to note the occurrence of the following species: In July last I found the pupa skins of a *Cossus* protruding from the trunks of Poplar trees at Corunna, Mich. One of these skins sent to Dr. J. A. Lintner was said by him to be identical with that of *C. centerensis* (vol. xi.–1). The exact locality is a grove of Poplars divided by the branch railway to the coal mine, a short distance before the river is reached. I obtained a half dozen of these shells in less than an hour's search. The moth should be sought from the 1st to the 15th of June.

Nephopteryx Zimmermani I found in the same locality common enough, both in cultivated and forest pines; it was especially abundant and destructive to small pines and spruces ornamenting the cemetery. I took eight pupæ from the trunk of one of these spruces; these trees had been visited by the axe. I also found the larvæ in force at Gowanda, N. Y., early in June.

D. S. KELLICOTT, Buffalo, N. Y.

FLIGHT OF BUTTERFLIES.

DEAR SIR,—

In the course of the last two or three years several accounts have appeared in *Nature* of flight of Lepidoptera in large numbers. I observed a similar phenomenon in 1870, which may present sufficient interest to be put on record. In the summer of that year, in the month of August as well as I remember, I was crossing the harbor of this city in the 3 p. m. trip of the stem-packet boat between the city and Moultrieville, on Sullivan's Island, at the entrance of the harbor, a summer resort of the inhabitants of our city. The distance is between four and five miles, and when about half way or perhaps two-thirds, the steamer passed through an immense stream of butterflies crossing the harbor towards the S. W. They were all of the genus *Callidryas*, whether *C. eubule* or *C. marcellina* (if indeed they be different species) I could not determine. The wind was light, and from the rapid motion of the vessel, it was difficult to say whether the insects were aided or opposed by it in their transit. As the vessel passed obliquely through the stream, their rate of motion could not be determined, and the dimensions of the stream only roughly estimated; it seemed to be six or eight yards wide, about as many high, and extended an hundred yards or more on each side of the vessel. Whence they came or whither they went could not be ascertained; they seemed to be crossing the harbor in a direction nearly parallel to the general travel of the coast.

LEWIS R. GIBBES, Charleston, S. C.

NOTES AND QUERIES.

DEAR SIR,—

I notice in the February number of the ENTOMOLOGIST some notes by Mr. Mundt, of Fairbury, Ill., in which he mentions breeding wood-boring insects. If Mr. Mundt and some other entomologists would give some information on the mode of keeping such insects, I am sure it would be most acceptable to the "Beginners in Entomology." Breeding specimens is of course one of the most important branches of the science which treats of their study, and heretofore very little has been done I believe with the wood-borers. I frequently find larvæ of Buprestidæ and Cerambycidæ in splitting cordwood, but so far I have signally failed to rear any of them. They either dry up or are attacked by mould. I think the chief points requiring attention are the temperature and the amount of moisture and air.

J. FLETCHER, Ottawa, Ont.

The Canadian Entomologist.

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ENTOMOLOGY FOR BEGINNERS.

TIGER BEETLES.

BY R. V. ROGERS, KINGSTON, ONT.

There are probably over ninety thousand different species of Beetles in the world, and first and foremost of this mighty legion stand the Cicindelidæ. Well, therefore, might they demand our attention from their high position in the Coleopterous world alone; but they have many other claims on our consideration. They are cosmopolitan—no pent-up Ithaca contracts their powers; they are beautiful; they are fierce; they are blood-thirsty; they are useful; and the family name is an old one—known to scientists and men of letters in the days when Jupiter and Juno were king and queen of heaven, to the inhabitants of old Rome.

The family is divided into several branches; in Canada we have only the representatives of one branch, but it is the original one, the Cicindelas. In the United States there are a couple of other branches as well, which reside principally far to the west.

There is much in a name. The patronymics Smith, Barber, Wright, tell the origin of the family at once; so *Cicindela* informs us that those that are so called are "bright and shining ones," while the English cognomen of Tiger Beetle lets all Anglo Saxons know that it is a creature that lives by preying on the blood of others. Brilliant, beautiful and elegant in shape are these beetles, and they appear to revel in the merry, merry sunshine; on every bright summer day they are to be found running and flying about sunny banks, sandy places and wherever the god of day beats down his life-giving rays; most of them avoid vegetation, as it would check their rapid progress; some species, however, linger in grassy spots among scattered trees. They are among the most predaceous of the Coleoptera; "they act like the tigers among Mammalia, the hawks among Birds, the crocodiles among Reptiles, or the sharks among Fishes." In some of them activity, as well as brilliancy of coloring, is

carried to the greatest perfection. In the tropics some few genera are found which alight only on the leaves of trees, but further north they are all terrestrial. The species are more numerous in the temperate and sub-tropical regions, and gradually disappear from view as we journey towards the north pole, until in the latitude of Manitoba (as we are told) but two or three are to be found.

Let us take our *instrumenta belli* and go in quest of some of the dozen species we have in Canada (in North America there are about one hundred). Let us hurry before yonder clouds obscure the sun, for then—like chickens in an eclipse—they will retire to their homes. Here is a likely spot, and there are some specimens of our commonest species *(C. vulgaris)*. Go for that one! He sees us as quickly as we spy him, and is off, flying rapidly for a few yards and then coming suddenly to the ground with his head towards the enemy. Again and again we start him; at length he tires of the chase and takes a longer flight than usual; we know his little plan, and hurry back to where we first saw him in time to see him alight all unsuspectingly, and we easily take him captive in our toils. Let us examine him. He savagely moves his mandibles and tries to pinch, but his bite is inoffensive and not very painful. Some of them give forth a rather strong scent. This one is a little over an inch long, but barely a quarter of one broad; his head is very large, for he has brains; his jaws are very strong, for he has an appetite, and long and curved—a couple of scimitars, in fact, by which he cuts and carves the quivering carcasses of his prey. His eleven-jointed antennæ are graceful, long and slender. 'Tis true that his back is of rather a dull purple color, but beneath he is resplendent in a beautiful bright brassy green. Each wing cover is adorned with three whitish irregular stripes. His legs are long and slender, just the things on which to hunt the active insects which he feeds upon.

Michelet speaks of the beauty of one of the next of kin of the captive in our fingers thus glowingly: "The rich and living aliment of the unfortunate insect victim apparently communicates to the Cicindela its glowing colors. Its entire body is embellished with them; on the wings a changeful besprinkling of peacock's eyes; on the fore parts numerous meanders, diversely and softly shaded, are trailed over a dark ground. Abdomen and legs are glazed with such rich hues that no enamel can sustain a comparison with them; the eye can scarcely endure their vivacity. The singular thing is, that beside these enamels you find the

dead tones of flowers and the butterfly's wing. To all these various elements add some singularities, which you would suppose to be the work of human art, in the Oriental styles, Persian and Turkish, or as in the Indian

Fig. 10.

Fig. 11.

Fig. 12.

shawl, where the colors, slightly subdued, have found an admirable basis, time having gradually lent a grave tone to their sweet harmony."

When we have let go our common Cicindela, *Cicindela vulgaris*, fig. 10, let us look at the pictures of his—not sisters—but of his cousins and his aunts.

The Purple Tiger Beetle (*C. purpurea* Riv.) is figured as No. 11. It is nearly the same size as *vulgaris*, and is often to be found in its company. Its general color is a beautiful metallic purple; sometimes, however, it assumes a greenish garb. On either wing cover there is a bent

Fig. 13

Fig. 14.

Fig. 15.

reddish line extended from the outer almost to the inner margin, a dot lower down and another at the extreme tip of the inner margin. It rather delights in chilly weather, and often appears before the snow is well gone.

Mr. Bethune says (Rep. Ent. Soc., 1873) that he has caught it in numbers in April, and on one occasion as early as the 17th March, before the snow was gone.

The Six-spotted Tiger Beetle (*C. sex-guttata* Fabr.), fig. 12, is a most beautiful insect of a most brilliant metallic green, flecked with three small white spots on each wing cover; Packard calls these markings "golden dots."

The Hairy-necked Tiger Beetle (*C. hirticollis* Say), fig. 13, is a common species closely resembling, though smaller than, *C. vulgaris;* it is distinguishable by having whitish hairs on its neck.

C. generosa Dej., fig. 14, is more strongly marked than the species already mentioned, and is considerably larger.

C. 12-guttata Dej. is smaller than *vulgaris*, brownish, and decorated with twelve smaller reddish spots.

C. punctulata Fab. is about the size of *C. 12-guttata*, and has a row of smaller dots along the inner margin of the wing covers, and a couple of irregular lines on each wing cover.

The Tiger Beetle may well be called a Beneficial Insect, and is a valuable and should be a valued friend of man, although some of the species living at the sea-shore feed upon small shrimps, to the loss of humanity. Although it does not, like that brilliant murderess, the Dragon-fly (to quote again the gushing Michelet) clear the atmosphere of the gnats and flies that torment mankind, still with its crossed daggers, which serve it for jaws, it accomplishes a swift and almost incredible havoc among the smaller insects. We should take care of it and respect it. It is an efficacious auxiliary to the agriculturist. The farmer by killing Tiger Beetles becomes the friend of those insect hosts that fatten on his labors —the preserver and protector of those little enemies which devour his substance. The ferocity of these insects is remarkable. They quickly tear off the wings and legs of their victim, and suck out the contents of its abdomen. Often, when they are disturbed in this agreeable occupation, not wishing to leave it, they fly away with their prey; but they cannot carry a heavy burden to any great distance.

They are true children of earth. The eggs are laid in the earth, and in the earth the grubs are hatched, and in the earth they spend their days, and in the earth they prepare their shrouds, and enwrapped therein sleep their pupa sleep through the long winter, and with the returning warmth

of spring crawl out of their earthy chambers to run and sport on earth, seldom using their new found wings to fly away from their beloved mother.

The grubs are curious creatures—hideous hunchbacks, fig. 15, but possessed of brain and stomach. They live in the same localities as their parents, the anxious mother having wisely deposited her eggs where food will be most easily attainable by the larvæ. Let us examine a grub. LeConte says that we can easily procure one in spring by placing a fine straw down one of their holes, for the grub will push it out, and rising above ground in his efforts, may be captured. Here is a hole, and down goes a straw. Master Cicindela does not like vegetables, and so seeks to eject it with his broad head; when he shows himself we quickly seize him. A perfect Daniel Quilp we find him, with head enormous, flat, metallic color, armed with long curved jaws. The legs are six in number, and on the back, half way between the legs and tail, "are two curious tubercles, each terminating in a pair of recurved hooks." The head and first division of the body are horny, the rest of the creature is soft. "The larva has all the desire for slaughter evinced by its parents, but its delicate skin, long body and short legs, not only prevent it from chasing prey, but from attempting a struggle with an insect of any size; nevertheless this imperfectly armed creature manages to obtain its food without exposing itself to much risk. With its short, thick, spiny legs it loosens the earth, and then using its flat head as a shovel, and turning itself into a Z, hoists up the clay and upsets it around the mouth of its intended hole. With head and legs, perseverance and time, it sinks a shaft as large in diameter as a lead pencil and about a foot in depth. (Dr. Duncan says that in England *C. campestris* runs a horizontal gallery as well.) The loose earth around the opening gives way on the approach of any insect and precipitates it into the jaws of the Cicindela, which then descends into its cavern and there at its leisure devours its food." The insect crawls in its tunnel with ease, and if it wishes to remain set fast it sticks the back of its body against the sides and rests safely with the aid of its hooks. In this position it can poke its head out of the ground, thus closing the entrance of its tunnel and awaiting until some ant or other insect passes over. The top of the larva's head forms the floor of the cavity, and when an insect touches it the larva descends at once and with great precipitation, and thus the victim falls into the hole. When fully grown the larva closes up the mouth of its abode, and in quiet and solitude undergoes its metamorphosis, lying dormant during the winter months.

COLLECTIONS OF THE LATE DR. ASA FITCH.

Having been requested by the family of the late Dr. Asa Fitch, State Entomologist of New York, to examine and report upon the condition of his great collection of insects, I visited Fitch's Point, Salem, N. Y., on the 12th and 13th of November last, and made as careful an investigation thereof as time and circumstances allowed. In the belief that the following items or notes are of general interest to all entomologists, they are respectfully submitted by Francis G. Sanborn, Consulting Naturalist, Andover, Mass. :

Dr. Fitch's "General Collection" of insects of all orders fills one hundred and six boxes ("Cartons liégés" of Deyrolle, nearly all of double depth, size 26 x 19½ cm.) and is now in excellent condition, suffering only to the extent of perhaps fifteen per ct. from a slight coating of dry mould, easily removed. No Anthrenus or other Dermestide is to be detected among them. Very few are badly broken or damaged, perhaps fifty in all out of upwards of fifty-five thousand numbers. Although chiefly from the U. S., the collection contains a fair percentage of European and other exotic species obtained by exchange with Drs. Sichel and Signorêt, and Messrs. Andrew Murray, Fairmain and others. The Coleoptera occupy eighteen boxes, the Orthoptera seven, Neuroptera six, Hymenoptera eight, Lepidoptera twenty-one, only four of which are Diurnal. The Hemiptera are nobly represented, the Heteropterous by fourteen, and the Homopterous by twelve ; to this latter division, as most students are aware, the Doctor devoted an exceptional amount of attention, and apparently all of his types, as described in the N. Y. State Agricultural Reports for many years, are here preserved in excellent order. The Diptera occupy five boxes, and four more contain Myriapoda, Arachnida and Crustacea, chiefly terrestrial and local.

In addition, two large cases of 62 draws or slides, and several boxes of various forms, contain by rough estimate over one hundred thousand duplicate Coleoptera and above twenty thousand of all other orders, principally of the Doctor's own collecting from New York State. Many of these, however, have suffered from the ravages of *Dermestes lardarius*, though not exceeding twenty per cent. The Biological illustrations, chiefly "Galls," are now in excellent order and well arranged, but liable to disarrangement in transportation. A vast amount of patient labor is

displayed in several boxes of Cecidomyia and allied genera, which had been carded and studied with great care, but which we found nearly destroyed by the little *Ptinus fur*.

A few hundred interesting and chiefly minute specimens from Hong Kong, collected by the late Rev. M. S. Culbertson, and a goodly number of larger forms from South America, sent him by Sr. A. de Lacerda, had apparently never been incorporated with the general collection.

The Catalogue, descriptive, and apparently nearly exhaustive, at least as regards the New York species, is a library of itself in one hundred and forty-eight note books 10 x 16 cm. (if my memory serves me), and none much less than an hundred pages, in which each specimen is numbered (beginning in 1833), with its locality, date of capture and incidents, accompanied in general with a preliminary brief diagnosis, and followed by a fuller description. As previously stated, the numbers of specimens reach fifty-five thousand, though many have doubtless been exchanged or destroyed.

A large and valuable library containing many rare and curious works on Entomology in various languages, and several microscopes, among them a valuable Nachêt made to order for the Doctor, are also stored in the little wooden building called "the office"—a few rods in the rear of the old dwelling-house. And the old shepherd dog that for some years past accompanied the venerable Doctor in his rambles, sleeps nightly on the mat at the entrance of the little "office," guarding the invaluable treasures which he may perhaps have helped to accumulate, while the busy brain and skillful hand of his old friend and companion are never more to acknowledge his faithful service.

DESCRIPTION OF A NEW GENUS AND SPECIES OF ZYGAENIDÆ.

BY BERTHOLD NEUMOEGEN, NEW YORK.

Genus Edwardsia, Neumoegen.

Head small, nearly concealed by the thorax. Clypeus oblong, toothed in front, the middle tooth much the largest. Palpi moderately long, and

pilose beneath. Antennæ regular and closely pectinated. Thorax and abdomen stout, the former with the hair of patagiæ long.

Abdomen with small tuft. Wings of the form of *Alypia*, with long fringes. Legs moderately long, the fore tibiæ with bunches of hair as in *Alypia;* hinder pair with two nearly equal pairs of spines.

This genus appears to be closely allied to *Pseudalypia* Hy. Edwards, but differs from all known genera of its group by its remarkable system of coloration, as well as by the characters noted above.

Dedicated to my good friend, Henry Edwards.

EDWARDSIA BRILLIANS, n. sp.

Head black, hairy, with base of the palpi and margin around the eyes pure white. Labial palpi black, well extended beyond the front. Antennæ about one-third the length of costal edge of primaries, and glossy above. Thorax black, with a median line of white hair. Patagiæ free and large, white with black edges.

Abdomen metallic steel black, glossy, with a discal spot at its base, and anal tuft, dark orange.

Legs black. Femora with light orange colored tufts, and orange bands. Tibiæ with orange colored scales, the posterior pair with the spines orange.

Primaries with the costal edge, extreme outer margin and internal margin, black, and a broad, submarginal, maculate band of reddish brown; the spots increasing in size towards the internal margin. The central portion of the wing largely occupied with pure white. The submarginal brown band, as well as its interior white band, follow the shape of the exterior margin as far as the median nervure, in equal width. At the junction of the median nervure these bands enlarge to nearly double their width down to the interior margin. On the white field are two black streaks proceeding from base of the wing, that on the internal margin straight and nearly equal in width for about one-half the extent of the wing; here it narrows and is surmounted by two black lines directed towards the median nervure, and enclosing an almost oval spot. The other black line follows the course of the median nervure to a space within about two lines of the outer margin of the wing, where it broadens a little and curves upwards, joining the costa. Above the median line in the centre is an almost oblong, black blotch, toothed towards the outer margin, and enclosing an orange centre, nearly the shape of the Latin I.

Anterior to this and resting on the median line is also an orange, sublunar patch, bordered by black. The spaces between the lines and blotches, above noted, being pure white. Fringes long, very distinct pure white.

Secondaries smoky black, with a slight bronze lustre, and indistinct traces of orange discal spot and submarginal band. Fringes concolorous.

Under side entirely bronze black. The primaries with an orange submarginal band extending nearly from costa to the internal margin. A broader orange band from costa to a little below median nervure, and anterior to this a triangular orange spot, resting on subcostal nervure. Fringes as in the upper side.

Expanse of wings 1.32 inches.

Location, South-western Texas. Collected by Mr. J. Boll in season of 1879.

DESCRIPTION OF PREPARATORY STAGES OF ARGYNNIS ALCESTIS, Edw.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG—Conoidal, truncated, not so broad at base as *Idalia*, the sides less rounded; depressed at summit; marked vertically by about eighteen prominent, slightly wavy ribs, half of which extend from base to summit and form around the latter a serrated rim; the remainder end irregularly at two thirds to three quarters distance from base, sometimes squarely at one of the striæ, but usually curve towards and unite with the long ribs; between each pair of ribs are equi-distant transverse striæ. Shape of *Aphrodite* and *Myrina*, being more slender, narrower at base, and less convex on sides than the other large species of this genus. In Mrs. Peart's magnified drawings the eggs of *Alcestis* and *Myrina* are indistinguishable from each other. Duration of this stage 25 to 30 days.

YOUNG LARVA—Length .08 inch; cylindrical, thickest anteriorly, tapering backward, the dorsum sloping considerably; color brownish-green, translucent; each segment from 3 to 12 marked by eight rows of tubercular dark spots, six of them placed on dorsum and upper part of sides, each spot giving out a long black clubbed hair, which is curved

forward; the other two rows are beneath spiracles (one on each side), and consist of much smaller spots, each with two or three short hairs; still lower down, in a line over the feet, are points, with fine hairs; on segment 2 is a blackish dorsal patch, and on either side are two small spots, and all these are furnished with hairs; on 13 is a row of four small spots, and behind it one of two; head a little broader than any segment, rounded, slightly bilobed, somewhat pilose; color dark brown.

Nearly all the larvæ became lethargic immediately after leaving the egg, having first devoured the egg shells; but a few, of a single brood in 1878, about ten per cent, fed and proceeded to first and subsequent moults. These gradually died off after first and second moults, but one lived several days after third, and died about 14th November. In the fall, the first moult was reached at about 18 days from the egg. The remaining larvæ were kept in a cool room, and such as survived were placed in the greenhouse 14th Jan., on violet, and began to pass first moult 11th Feb., or after 28 days.

AFTER FIRST MOULT—Length .15 inch; thickest in middle; color yellow-green, on dorsum mottled with brown, especially at bases of spines; the spines, which in all the Argynnids make their first appearance at this stage, form six longitudinal rows of large spines, two of which may be described as dorsal and two as lateral, besides a row of very small spines along base of body, over the feet; the dorsals begin at 2 and run to 13, one upon each segment, in each row; the two laterals begin at 5, and the upper one stops at 12. the lower continuing to 13, always but one on each segment; on either side of 2 are two minute tubercles with hairs, two also on 3, and three on 4; between 2 and 3 and between 3 and 4, at junction of the segments, is set a large spine which lies between the dorsal and first lateral row on each side; (this arrangement of spines probably belongs to the entire genus, at least to all species whose caterpillars are known to me, and continues till last larval stage); spines long, tapering, black, beset with many short and fine black bristles; the spines on second lateral row now rise from yellowish tubercles (but in some examples these spines were green and rose from greenish tubercles); all others from black ones; head sub-cordate, black, with many short black hairs. To second moult in fall 5 to 7 days; in spring from 14 to 24 days.

AFTER SECOND MOULT—Length .22 inch; shape as at previous stage; color black-brown, the sides less dark than dorsum; the tubercles

of the dorsal spines are pale buff on outer side, but black on dorsal side ; the first laterals have black tubercles, and second laterals buff ; the intermediate tubercles on anterior segments are yellow ; the dorsal spines on 2 are somewhat turned forward, but are no longer than others of same rows ; head as before, except that on each vertex now appears a small conical black process. To third moult, in fall, 6 days ; in spring, 7 to 12 days.

AFTER THIRD MOULT—Length .3 inch ; color velvety-black with a brown tint ; the spines much longer and heavier than before ; the outer side of tubercles of the dorsal rows is now dull yellow ; the spines of first lateral row have very little yellow at base, and those of lower row are yellow at base and a little way up ; head sub-cordate, much flattened frontally, and on the summit of each vertex is a small sharp process as before ; many small tuberculations over the face, each of which sends out a black hair ; color of front head shining black, but the back is yellow. To next moult, in spring, 11 to 14 days.

AFTER FOURTH MOULT—Length .5 inch ; color as at previous stage ; spines black, both dorsals and first laterals very slightly colored reddish-yellow at base, scarcely visible except when viewed obliquely ; the lower laterals and also the intermediate spines on anterior segments are all orange at base and about half way up ; head as before, much flattened ; color black, orange at back. In some examples the bases of lower spines and the back of the head were reddish-yellow in the early part of this stage, but became orange later. To next and last moult 15 days.

AFTER FIFTH MOULT—Length .8 inch ; color velvety black ; the dorsal spines are drab at base, except those on 2 and 3, which are brownish-yellow ; all the spines of the two other rows are of same yellow at base, but the tubercles orange ; the back of head a yellow-orange. At about 20 days after the moult the larva reached maturity.

MATURE LARVA—Length 1.4 inch at rest, greatest breadth across middle of segment .3 inch ; length in motion 1.8 inch ; cylindrical, of even thickness from 5 to 11, the segments rounded ; color velvety-black ; the spines long, slender, tapering, of about equal length (the dorsals on middle segments measure .15 inch to tubercle, .16 to skin), the long spines on 2 are directed forward, but are not longer than others ; all the spines are beset with many short black bristles ; those of the dorsal rows are

translucent brown at base, except on 3 and 4, where they are dull yellow; all of the two lateral and the intermediate rows are dull yellow from base (including the tubercles) half way to top; tops of all spines and all the bristles black; feet and legs brown; head sub-cordate, deeply cleft, flattened in front; on each vertex a small conical process; over the front many short black hairs; color black, the back of head reddish-yellow, sometimes dull yellow. Twenty-four hours after suspension the larva pupated.

CHRYSALIS—Length 1 inch, greatest breadth .3 inch; shape of *Diana;* cylindrical, a little compressed laterally, the wing cases prominent and flaring at the base on ventral side; the whole surface finely corrugated; head case square, bevelled at the sides, rounded transversely, the outline from top of mesonotum to extremity being arched; on either vertex a small conical process; mesonotum carinated, followed by a deep rounded excavation; on middle of either side of mesonotum a small conical tubercle; on the abdomen two dorsal rows of similar tubercles and a row of small ones on each side; the color varies somewhat, some examples being red-brown, irregularly mottled with black; on the wing cases red-brown and the black is limited mostly to the disk and nervures; others are drab and black, the wing cases finely streaked with black, otherwise drab; on the abdomen the front part of each segment is black, the rest drab, irregularly serrated at the junction. Duration of this stage 22 days.

(My larval descriptions are in all cases drawn shortly after the hatching or after the moult, say from 12 to 24 hours. In this period of the stage the colors are fresher than afterwards. Some larvae, as Limenitis *Arthemis*, change color essentially two or three days after some of the moults, and in all cases, as the next moult approaches, the skin loses its freshness and all color becomes dulled.)

I have received eggs of *Alcestis* several times, and in the years 1876, '77 and '78, from Mr. Worthington and Mr. Bean, the one at Chicago, the other at Galena. The females were shut up with plants of violet and laid abundantly, in September. I have stated above that some of the larvae in 1878 fed, after leaving the egg, and went on to second and one to even third moult, but that these all died on the approach of cold weather. I have known no other instance among our large Argynnids, *Diana*, *Idalia*, *Cybele*, *Aphrodite*, where the larvae proceeded to feed and moult the same

season in which they emerged from the egg, but invariably they have become lethargic forthwith.

The geographical limits of *Alcestis* are not yet determined. It seems to be abundant in northern Indiana and Illinois, and I have received it from Nebraska. The species is near *Aphrodite*, and may be distinguished by its deep red color in both sexes, and by the color of under surface. In the female this is wholly dark ferruginous on secondaries, from base to margin, or sometimes olive-black, like *Idalia*, and there is an absence of the band between the outer rows of silver spots; the male either very dark brown, or ferruginous-brown, from base to margin, without mottling of buff or drab as seen in *Aphrodite*. Sometimes there is a trace of the band, but it is always very slight, rather a showing of a light sub-color through the coating of brown than a band.

In Can. Ent., vi., p. 124, 1874, I stated some facts which had puzzled me in the history of our larger Argynnids, namely, that at Coalburgh, while fresh examples of *Cybele* and *Diana* appeared about 1st to 20th June, no traces of eggs had been found in the females, after repeated dissections of *Cybele* between June and August; but that early in August the eggs become distinguishable and rapidly mature, and before last of that month are deposited, and from that on to first of October. Multitudes of fresh individuals appear in early August. There also seemed to be too short an interval between middle of June and last of July for the growth of the larvae and the chrysalis period, inasmuch as every stage was greatly prolonged in the spring, so that about four months intervened between hybernation and the butterfly, as I had treated the larvae. And I suggested that there might be irregularity in the emergence of the butterflies from the same lot of eggs laid in September, so that some few might appear in June and the rest in August. I now am of the opinion that there are two annual broods. The experience, in fall of 1878, with those larvae of *Alcestis* which proceeded to feed instead of going into lethargy, and passed two and three moults, within a very much shorter period than has been observed in the spring, showed that six weeks in midsummer might not improbably be long enough for all the changes. Perhaps also there are but four larval moults in the summer brood, as in some of the Melitæas, though there are five in the winter brood. Every stage would be shortened by the hot weather of July. On 14th June, 1878, I saw a pair of *Cybele* flying, in copulation. In all instances where this has happened with butterflies under my observation, and the females have been

secured, and this includes Arg. *Atlantis* (Can. Ent., vii., p. 35, 1875) and *Myrina* (id. viii., p. 162, 1876), eggs have been laid within a few hours after. Mr. Siewers, at Newport, Ky., had twice observed pairs of *Cybele* in same condition in early summer. Eggs laid 15th June would allow about two months for the several stages to imago.

Note.—I received recently a letter from an active collector and breeder of butterflies, in which he says: "I would like to ask you why you call the segment back of the head, in your descriptions of larvæ, the second segment. Other authors, without a single exception, so far as I know, call it the first segment. By your calling it the second and numbering the other segments in accordance, your descriptions are apt to be misleading to those who are used to the descriptions of other authors."

This led me to look up the authorities and see if I was so unorthodox as my correspondent supposed. And first I examined Burmeister, Manual of Entomology, translated by Shuckard, London, 1836, a book to which I always go for directions and advice in things entomological. It is unnecessary to say that this author is *facile princeps* in his department. And on page 35, section 53, I read: "All larvae with a perfect metamorphosis have a long, generally cylindrical body, composed of 13 more or less distinct rings or segments." "The head always occupies the first of the 13 segments." Next Westwood, whose Introduction, London, 1840, should be in the library of every working entomologist: "The larvae (of lepidoptera) are long and cylindrical, composed of 13 segments, of which the anterior represents the head of the imago," vol. 2, page 319. Westwood in 1838, in his Entomologist's Text Book, London, page 397, has said: "They (the caterpillars) are composed of 13 rings, of which the first represents the head."

Looking over the larval descriptions in back volumes of the Entomologist's Monthly Magazine, the organ of the Ent. Soc. of London, I find all the writers, including such veterans in this branch as Gosse, Buckler and others, speak of the segments as 13, and count the head as number one. It would seem to be the rule with English entomologists. It is true Dr. Boisduval makes but 12 segments, not counting the head, but I apprehend the weight of authority is on the other side. It certainly is best that there should be uniformity in such a matter, if for no other reason, to prevent confusion such as my correspondent speaks of, and I think we cannot do better than to adopt the method of the German Burmeister, and our English brethren.

A FEW NOTES ON N. AMERICAN ACRIDII.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

I have long had upon my desk a partly completed revision of the Calliptenoid series of N. American Acridians. The task I have undertaken in the study of our fossil insects has hitherto prevented its completion; and as it bids fair to be long delayed, the following notes are published for the assistance of students of that special group, which is remarkably developed in the United States, from whence I have about one hundred species, while Europe scarcely possesses a dozen.

In a short paper on dimorphism in western Acridians,* I called attention to the long and short-winged forms in the species of this group. A few examples may be given: thus *Pezotettix plagosus* Scudd. and *Caloptenus Turnbulli* Thom. are to be referred to the same species; *Pezotettix abditum* Dodge and *Caloptenus junius* Dodge seem to belong together;† the same may be said of *Pezotettix nigrescens* Scudd. and *Melanoplus clypeatus* (*Caloptenus clypeatus* Scudd.); *Pezotettix Scudderi* Uhler resembles *Melanoplus glaucipes* Scudd. at a further remove; while not only is *Pezotettix enigma* Scudd. apparently merely a short-winged form of *Melanoplus collaris* Scudd., but *Pezotettix jucunda* Scudd. is perhaps only an impoverished form of the same, with still shorter tegmina.

It is rather remarkable that aside from the above, very few of our species have been twice named. A few synonyms, however, have occurred to me in addition to some already published. *Pezotettix flavoannulatus* La Munyon, 1877, is *Pezotettix picta* Thomas, 1870; *Pezotettix borealis* Scudd, 1862, is *Pezotettix septentrionalis* Sauss., 1861; *Pezotettix tellustris* Scudd., 1877, is *Pezotettix Dawsoni* Scudd., 1875; *Pezotettix minutipennis* Thom. (Dec.), 1876, is *Pezotettix gracilis* Bruner (July) 1876; *Pezotettix viola* Thom. has been in my collection for years under the MSS. name *P. affiliatus* Uhl.; but Mr. Thomas's is the only published name.

Finally *Pezotettix obesa* Thom. must form the type of a new genus, for which the name of Bradynotes is proposed. It is most nearly allied

* Proc. Bost. Soc. Nat. Hist., xix., 336.

† Unless my memory is at fault, Mr. Dodge has independently reached the same conclusion concerning these two forms.

indeed to Pezotettix, but has some characters which ally it more closely to Calliptenus proper, and not a few points of general resemblance to Ommatolampis, although the structure of the tarsi is different. It is remarkable for the form of the sternal surface of the thorax, the obsolescence of the prosternal spine, the unarmed edge of the last dorsal abdominal segment of the ♂ and the great robustness of the body, especially of the ♀.

Bradynotes, nov. gen. The head is stout, rather broader below than above, the cheeks being full; the space between the upper edge of the mandibles and the lower border of the eye is equal to (♂) or rather less than (♀) the height of the eye; vertex between the eyes broad; front well rounded, not oblique, the frontal costa prominent, rather broad and sulcate; antennæ slender, equal, shorter than the hind femora. Thorax very stout, the pronotum very short, not covering the whole of the mesonotum, both front and hind borders straight, the posterior lobe only half as long as the anterior and rugulose, while the anterior lobe is smooth; lateral lobes separated from the dorsum by distinct rugæ; prosternal spine very much abbreviated, becoming in the ♀ a mere blunt tubercle, and in the ♂ very short and conical; mesostethium and metastethium together fully as broad as long, the metasternal lobes distant in the ♀, approximate in the ♂. Tegmina and wings altogether wanting. Hind femora small, moderately stout, reaching the tip of the abdomen in the ♂, but not in the ♀, the upper carina smooth; spines of hind tibiæ equal in both rows, the lateral edges of the tibiæ between them smooth and rounded; first hind tarsal joint perhaps a little longer than the last joint, but certainly shorter than the second and third joints together. Terminal abdominal joints of the abdomen of the ♀ short, making the tip blunt, as in the series of Pezotettix represented by *P. jucunda* Scudd.; abdomen of male upcurved apically, the last ventral segment being long; hinder edge of the last dorsal segment smooth and entire, unprovided with tubercles or prolongations as in Pezotettix and Melanoplus.

The only species known to me is *B. obesa* (*Pez. obesa* Thom.)

Annual Report of the Entomological Society of Ontario.—The Annual Report of our Society has been issued and mailed to our members. Should any fail to receive their copies they will please communicate with the Editor or Secretary-Treasurer.

PRELIMINARY LIST OF NORTH AMERICAN SPECIES OF CRAMBUS.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

CRAMBUS Fab.

satrapellus Zinck. in Germ. Mag. iv., 247 ; Zeller Mon., 16.
Hab. "Georgia." Florida (Schwarz).

praefectellus Zinck. in Germ. Mag. iv., 249 ; Zeller, Mon. 17 ; *involutellus* Clem., Proc. A. N. S. Phil., 1860, 203.
Hab. Can., N. Y., Tex., Mass.

quinquecreatus Zell., Ex. Microlep. 38, T. 1, fig. 16.
Hab. "Texas."

Leachellus Zinck. Germ. Mag. iv., 114 ; ? *involutellus* Clem. Proc. A. N. S. P. 1860, 203 ; Zeller, Mon. 18. ? *pulchellus* Zell., Mon. 18.
Hab. Vancouver Island, Texas, Maine, New York.
var. occidentalis Grote, Can. Ent., xii., 16.
Hab. San Francisco, Cal.

Girardellus Clem., Proc. A. N. S. Phil., 1860, 204 ; Zeller, Mon. 19.
Hab. N. Y., Ohio, Mass., Penn.

sericinellus Zell., Mon. 49.
Hab. Maine, N. Y., Mass., Ohio.

floridus Zell., Peitr. 1, 91.
Hab. "Mass."

labradoriensis Christ., Ent. Zeit. 19, 314; W. E. M. 4, 379.
Hab. "Labrador."

agitatellus Clem., Pro. A. N. S. P. 1860, 203 ; Zell., Mon. 21.
var. alboclavellus Schlaeger, Zell., Mon. 19.
Hab. Ohio, N. Y., Ill., Va., Mass., Tex.

saltuellus Zell., Mon. 22.
Hab. N. Y., Mass.

bidens Zell., Beitr. 1, 89.
Hab. N. Y., Mass.

minimellus Rob., Ann. N. Y. Lyc. N. H., 11, 315.
Hab. Penn.

argillaceellus Pack., Proc. B. S. N. H., 11, 32.
Hab. "Labrador."

albellus Clem. Proc. A. N. S. Phil., 1860, 204 ; Zell. Mon. 23.
Hab. Maine, Mass., N. Y., Penn.
bipunctellus Zell., Mon. 23 ; Rob.; Ann. N. Y. Lyc. N. H., 9, 316.
Hab. Ohio, Illinois, Penn., Can.
laqueatellus Clem., Proc. A. N. S. Phil., 1860, 203 ; Zell., Mon. 24.
Hab. Tex., Ill., Mass., N. Y., Ohio.
topiarius Zell., Sr. Ent. Zeit., 1866, 155 ; Grote, Can. Ent., 12, 17.
Hab. N. Y., Sierra Nev., Cal.
Goodellianus Grote, Can. Ent., 12, 17.
Hab. Mass., *Penn.*
decorellus Zinck., Germ, Mag. iv., 250 ; *polyactinellus* Kollar, Zell., Mon. 25 ; Beitr. 1, 92.
Hab. "Texas."
plejadellus Zinck., Germ. Mag. iv., 251 ; Zell., Mon. 26.
Hab. "Georgia."
teterellus Zinck., Germ. Mag. iv., 252 ; *camurellus* Clem., P. A. N. S. Phil., 1860, 203 ; *terrellus* Zell., Mon. 27.
Hab. Georgia, Texas, Ohio.
elegans Clem., Proc. A. N. S. Phil., 1860, 204 ; *terminellus* Zell., Mon. 27 ; Ex. Microlep. 45.
Hab. Ohio, N. Y., Penn., Tex.
oregonicus Grote, Can. Ent., 11, 17 ; N. Am. Ent., 1, 68, pl. 5, fig. 9.
Hab. Oregon.
trichostomus Christ., Ent. Zeit., 1858, 313 W. E. M., 4, 379.
Hab. Labrador !
interruptus Grote, Can. Ent., 9, 101 ; C. E., 11, 15.
Hab. Can., Maine.
dissectus Grote, Can. Ent., 9, 16 ; N. Am. Ent., 1, 68, plate 5, fig. 8.
Hab. Maine, N. Y.
unistriatellus Pack., Proc. B. S. N. H., 11, 32 ; *exesus* Grote, Can. Ent., 11, 16 ; N. Am. Ent., 1, 68, pl. 5, fig. 7.
Hab. Maine, N. Y., Penn., Labr.
exsiccatus Zell., Mon. 37.
Hab. Maine, N. Y., Ill., Vancouver.
anceps Grote, Can. Ent., 11, 18.
Hab. San Francisco, Cal.
laciniellus Grote, Can. Ent., 11, 18.
Hab. Maine.

caliginosellus Clem., Proc. A. N. S. Phil., 1860, 203.
Hab. N. Y.

duplicatus, n. s.

♀. Head, thorax and fore wings obscure clayey yellow. Hind wings and abdomen rather dark fuscous. Fore wings crossed by two *double* angulated brown lines, hence differing from *caliginosellus*, where the lines are single, and the ground color is different. Beneath brownish fuscous, palpi at the sides brownish. The surfaces of primaries above show scattered dark scales about the disc and at base; a fine brown terminal line; fringes fuscous, pale at base. *Expanse* 20 mil.; N. Y., June 23, W. W. Hill, coll.

fusciostellus Zell., Mon. 44; ? *mutabilis* Clem. P. A. N. S. P., 1860, 204.
Hab. Fla., Tex., N. Y., Ohio, Ill.

attenuatus Grote, Can. Ent., 11, 18.
Hab. Vancouver Island.

hemiochrellus Zell., Ex. Microlep., 49.
Hab. "Texas."

ruricolellus Zell., Mon. 40.
Hab. N. Y., Penn., Ohio, Ill., Me.

vulgivagellus Clem., Proc. A. N. S. Phil., 1860, 203; *chalybirostris* Zell., Mon. 40.
Hab. N. Y., Penn., Ohio, Ill., Me., Vancouver.

luteolellus Clem., Proc. A. N. S. Phil., 1860, 203.
Hab. ?

s. g. *Propexus* Gr.

edonis Grote, Can. Ent., 11, 19; N. Am. Ent., 1, 68, plate 5, fig. 11.
Hab. Kansas.

pexellus Kaden, Zell., Mon. 48.
Hab. Texas, Col.

pectinifer Zeller, Exot. Microlep., 51, pl. 1, fig. 20 a, b.
Hab. "Texas."

repandus, n. s.

♂. Antennæ with a single outer row of short teeth, obsolete at base, continued to tips. The stem is outwardly pure white. The teeth increase very slightly in size towards the middle and taper very gradually; they are ciliated. Whitish. Fine dark brown lines run along the interspaces. At the extremity of cell an acutely angled broken line; the longitudinal lines on cell and

submedian space are nearly black. The exterior, not angulated, transverse line is broken into brown marks nearly continuous, and followed by a whitish shade. A fine black, partly dotted, terminal hair line ; fringes silver at base, else whitish interrupted with brown. Palpi outwardly brownish ; head and thorax whitish, more or less brown tinged. Hind wings slightly soiled with white fringes. *Expanse* 32 mil. Colorado, Mr. Hulst. This species differs from *pectinifer* in the shorter antennal teeth, the white scales on the stem, and in the bleached fore wings with their fine dark longitudinal hair-lines, together with the silver base of the fringes.

In making out this List I have omitted references to the British Museum, where undoubtedly many of our species are represented under different names. I am obliged to Prof. Fernald for sending me specimens of Dr. Packard's species, whose paper I had overlooked.

Prof. Zeller's excellent monograph should have priority over Walker's compilation in the B. M. Lists, not only on account of its merits, but because there is evidence of its issue as early at least as March, 1863. A separate edition was afterwards printed in July, 1863.

NOTE.—Since writing the above List I am indebted to Prof. Fernald for the identification of *Crambus inornatellus* Clem., Proc. Ent. Soc Phil., 2, 418, March, 1864. It is a synonym of *sericinellus* Zeller, and should be added to the synonymy given above.

CORRESPONDENCE.

The paper on three new species of *Botis* in the February number was issued without my seeing the proof. I had, subsequently to writing the paper, discovered that *dissectalis* was a fresh and bright specimen of my *submedialis*, CAN. ENT., 8, 111. The ringlet in submedian space is so obliterate as to allow only its traces to be made out on very close inspection. With this exception the description last published is naturally the best, as my type of *submedialis* is somewhat faded and worn. The species may be quickly known by the dark under surface, broken by pale spots, the squarely produced fascia on secondaries above, the three open ringlets on the yellow primaries, with their discolorous fuscous fringes, and the vague fuscous subterminal shade diffuse subcostally on both pair of wings. The species may be known as *submedialis*, with *dissectalis* as a synonym.

A. R. GROTE, Buffalo, N. Y.

The Canadian Entomologist.

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ON THE DESTRUCTION OF OBNOXIOUS INSECTS BY YEAST.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The paper published CANAD. ENT., vol. xi., p. 110-14, was reprinted with some additions as a pamphlet, Cambridge, December, 1879. The recorded experiment on the Potato Bug made by Mr. James H. Burns, proved evidently the poisonous character of the yeast-fungus. The fifty beetles which were sprinkled with it died mostly on the eighth day, and the rest in the four following days. None of them survived. There were collected at the same time, October 2, and at the same place, fifty other beetles, which were kept in the same room. Of these, which were not sprinkled, to Nov. 14th only three had died, and March 1st twenty-five lived still brightly. The experiment is so far a decided success, as it has proved *that insects are killed* by the application of yeast. I may add that an experiment made a few weeks ago in a green-house seems to be successful in killing Aphides.

Dr. Metschnikoff has published a pamphlet, Odessa, 1879, and a record of it, Zool. Anzuger, 1880, Feb., concerning his experiments in destroying obnoxious insects *(Anisoplia* and *Cleonus)* by the application of fungus. The difficulty of raising the fungus chosen by him *(Isaria vixescens)* in sufficiently large quantities he hopes to overcome by raising the *Isaria* in beer-mash.

Mr. A. Giard, Lille, France (Bull. So. de Department de Nord., sec. 2, An. 2, No. 11), has published a paper containing very interesting facts regarding insect epizootics. The discovery of L. Nowakowski of the copulation of some *Entomophthora*, and the conclusive proof given by O. Brefeld that *Tarichium* is only a different form of which the *Status conidiophorus* is the *Empusa*, induce Mr. Giard to retain for the genus the name *Entomophthora*, for its asexual form the name *Tarichium*, for its sexual form the name *Empusa*. In summer, when insects in which those fungi

develop are abundant, the reproduction is an agamous one ; in the fall, when insects become scarce, a sexual generation appears, which produces oospores not germinating before the following spring.

Mr. Giard believes that *Tarichium megaspermum*, the parasitic fungus of the caterpillar of *Agrotis segetum*, and first described by Dr. Cohn, could be used by farmers as a very important poison to destroy those obnoxious insects—the more as O. Brefeld has proved by conclusive experiments that the caterpillar of *Pieris brassicæ* is very easily infested by sprinkling with water in which spores of *E. sphaerosperma* (the parasite of this species) are put in. Therefore the mummified caterpillars filled with spores should be collected in winter for use the next spring against this species. (The same has been suggested as long ago as 1874 by Dr. John L. LeConte.) The *Entomophthora* seem to attack by preference the caterpillars of the double-brooded species, which pass the winter without transforming in the chrysalis state. Mr. Giard explains thus the casual rarity of some very common species of *Chelonia*. The hypothesis of O. Brefeld that *Tarichium megaspermum* of *Agrotis* could be perhaps only a different form of *Empusa muscæ* is rejected by Mr. Giard, he having discovered, as he submits, the *Tarichium* state of *Empusa muscæ*, which was not known before. The opinion that both forms of a fungus develop exclusively on the same animal, similarly as other parasitic insects, can, until it is proved by doubtless evidence, hardly be accepted. We know well that the different stages of entozoa develop in very different animals, and the presumption that fungi follow a similar course is at least probable.

There are published objections against my proposition to use the yeast fungus for destruction of insects. All are based upon the same fact, that Dr. Bail's views concerning the identity of some fungi are not accepted by Botanists. As the number of students of microscopical fungi is rather limited, and as I have never studied them, I used the excellent chance to rely upon the views of my savant colleague, Prof. Farlow, which he had kindly communicated to me. Therefore I stated as a fact that " Dr. Bail's views are now not accepted by prominent Botanists," and further that " this question is without any influence regarding my proposition." I believed it to be fair to state that actually Dr. Bail has discovered the yeast fungus to be poisonous to insects, and therefore I was obliged to quote the ways and the experiments which had led him to this discovery. As Dr. Bail had not suggested the use of the yeast for the destruction of insects—

though this suggestion is the evident consequence of his discovery—and as I found it not done by anybody else, I recommended experiments to be made with the yeast fungus. The experiment with the Potato Bug has proved that yeast fungus externally brought in contact with insects, kills them. Therefore objections based on botanical grounds can not more be admitted, and the Botanists will sooner or later find the true explanation of the facts.

It has been contended that "as long as a scientific basis for the use of the yeast is not more established, a practical application of the same is simply out of question." This assertion is a rather strange one, the more so as nothing is known about the scientific basis of Pyrethrum, of Paris green and other remedies. It has apparently been overlooked that I found in the dead beetles which had been sprinkled, in the large sinus of the wings, spores in quantity. Those spores resembled the figures given by Dr. Rees (Unters. ueber die Alcoholgaehrungspilze Leipzig, 1870, pl. 1, f. 15, e. d.) and were so numerous and so distinct that I could not have been deceived, the more as I am familiar with the blood fluid of insects and its corpuscles. I did not find such spores in the sinus of the wings of beetles which had not been sprinkled. There is nothing in the size and the shape of the yeast spores which could prevent them from entering an insect's body and producing disease.

Since the above was in type I have received a letter from Germany stating that sprinkling with the atomizer of diluted (compressed) yeast, a half an ounce package in three liter of water, on Aphides in greenhouses, was successful to an exceeding degree.

NOTES ON THE LARVA OF HETEROCAMPA PULVEREA, G. & R.

BY G. H. FRENCH, CARBONDALE, ILL.

Length when at rest, 1.25 inches; in shape tapering slightly from the middle forward, but more rapidly from that point backward; the body deeper than broad. General color bright clear green, a little spotted with white, marked as follows: head gray, a little lighter through the centre; joint 1 contains two dark purplish black warts on the dorsum, reddish

purple at the base, the space between them whitish. From these runs backward a bright brownish purple line, not very dark, at first about one-sixteenth of an inch wide. This expands, reaching the sub-dorsum in the posterior part of joint 4, dividing in the middle in joint 3. The lines run along the subdorsal region to the posterior part of joint 6, when they unite and cover the whole of the dorsal part of joint 7 and all but a little of the posterior part of joint 8, when it again separates and runs as two lines to the posterior part of joint 9. The space on the back of joints 3, 4, 5 and 6 between the purple lines is filled with orange. On joint 4 a spur is given off from the purple line to the third thoracic leg, another runs from joint 6 to the first pro-leg, another short spur on joint 9; both of the last with oblique lines of lighter shade. On joint 9 the orange is outside the purple, extending down the lateral spurs. Joint 10 has no purple nor orange except a little below the stigmata, but it has faint yellow subdorsal lines. Joint 11 has purple subdorsal lines which unite on the anterior part of joint 12, continuing backward as a broad dorsal line, darkest on the anal plate. The space on joint 11 between the subdorsals is filled with orange. Feet and legs purple, but the rest of the under side green; under the glass the above described brownish purple lines are not uniform, but mottled with irregular lighter lines.

The single larva from which the above description was taken was found June 30th on the body of a white oak tree. During the few days before it pupated I fed it on the leaves of *Quercus alba* and *Q. coccinea*, both of which it ate readily. July 6th it entered the dirt of the cage to transform, and produced the imago August 6th.

NORTH AMERICAN NOCTUIDÆ IN THE ZUTRAEGE.

FIRST HUNDRED.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

Schinia gracilenta, 8, fig. 5-6.

"Georgia." I have identified this species among Belfrage's Texan collections.

Drasteria graphica, 8, fig. 11-12.

"Georgia." The hind wings are rusty-yellow, "rostgelb"; whether it is the species which passes under the name in our collections might admit of some doubt from the color of secondaries, but the s. t. line is followed by pale dots on the veins as in *graphica;* the band on hind wings is broken in the figure.

Epizeuxis lituralis, 9, fig. 19-20.

"Georgia." Described by me as *Megachyta lituralis*, Trans. Am. Ent. Soc., 306, Jan., 1873.

Hypsoropha monilis Fabr., 10, fig. 23–24.

"Georgia." I have identified this species in Prof. Snow's Kansas collections.

Polygrammate hebræicum, 10, fig. 25–26.

"Georgia." I have identified this species in the Philadelphia collections. It is the *P. hebraicum* of my Check List, No. 80.

Hypsoropha hormos, 10, fig. 27–28.

"Georgia." I have collected this commonly in Alabama.

Ephesia elonympha, 11, fig. 29-30.

"Georgia." Generally known in collections; Alabama (Grote); various localities in Middle and Western States.

Zale horrida, 11, fig. 31–32.

"Georgia." This species is the *Homoptera calycanthata* of Walker and Bethune, but not of Abbot. Common; I proposed to distinguish the genus by the exaggerated thoracic tufts.

Schinia trifascia, 11, fig. 33–34.

"Georgia." I have identified this species from Alabama and Texas. See Proc. Bost. Soc. N. H., 242, 1874, in describing an allied species, *S. rectifascia* Grote.

Phoberia rufimargo, 13, fig. 45–46.

"Georgia." This is the *Panopoda ruficosta* of Gueneé, the *P. Cressonii* Grote, and brightly colored specimens are, without doubt, the *roseicosta* of Gueneé. A common and variable form throughout Southern New England, south and westward.

Cryphia nana, 14, fig. 53-54.

"Georgia." A small obscure form not yet recognized.

Schinia bifascia, 14, fig. 55–56.

"Georgia." Unknown to me. It may be a var. of *gracilenta*.

Ephesia amica, 14, fig. 57–58.

"Georgia." This is the well-known *Catocala androphila* of Gueneé.

Cerma cora, 14, fig. 59–60.

"Georgia." I have this species from Canada. It may be the *Charitptera festa* of Gueneé.

Fodia rufago, 15, fig. 61–62.

"Georgia." I have identified this species in several collections. It appears to be southern and western.

Parallelia bistriaris, 15, fig. 63–64.

"Georgia." A common moth in all collections.

Phosphila turbulenta, 15, fig. 67-68.

"Georgia." I have identified specimens from the Middle States and referred the moth to *Hadena*, Bull. Buff. Soc. N. S., I., 180.

Drasteria cuspidea, 16, fig. 69-70.

"Georgia." A well-known species, California and Atlantic district. Referred to *Euclidia* in the Check List.

Elaphria grata, 16, fig. 71-72.

"Georgia." I have identified as this species the insect subsequently described by Mr. Morrison as *Hadena rasilis*. Mr. Morrison would see in this species of Hübner's the *Taeniocampa oviduca* of Gueneé, but I am not of this opinion. It is not an easy question to settle.

Xestia chloropha, 16, fig. 73-74.

"Georgia." Unknown to me. The figures look a little like *Drasteria convalescens* ♀.

Phoberia atomaris, 16, fig. 75-76.

"Georgia." I have identified with this common southern form the *Lyssia orthosioides* of Gueneé. It is often mistaken for the Cotton Moth, and some years ago was sent me by Prof. Baird as having been received by him from a correspondent as specimens of *Aletia*.

Melipotis jucunda, 17, fig. 81-82.

"Georgia." A common species, also in California (?). I have never seen a specimen so colored on the disc of primaries. The variety *versabilis* of Harvey is of a uniform dirty gray; Mr. Hy. Edwards has sent me a rubbed specimen from Havilah, which I think belongs to this variety.

Lithacodia bellicula, 18, fig. 85-86.

"Georgia." I have little doubt that this is the species generally known

under the name, but the figure is more highly colored than any specimens I have seen.

Pangrapta decoralis, 18, fig. 91-92.

"Georgia." I have identified this species with the *Hypena elegantalis* of Fitch., Trans. Am. Ent. Soc., iv., 92. Southern specimens are darker, smaller, and more intensely colored. Collected by Mr. Schwarz at Enterprise, Florida.

Phacocyma lunifera, 19, fig. 97-98.

"Georgia." Figured also by Gueneé, 15, fig. 9. My identification of this species is as yet provisional, nor can I distinguish the genus from *Homoptera*.

Triaena tritona, 21, fig. 107-108.

"New Georgia." I have identified this species in the New York collections.

Paectes pygmaea, 21, fig. 109-110.

"Georgia." Hübner compares this species with *urticae;* but I think it is a species of *Ingura*, allied to *praepilata*. I never saw a *praepilata* so marked and colored, and have not identified Hübner's species.

Ptichodis bistrigata, 21, fig. 111-112.

"New Georgia." Referred by Guen., 3, 303, to *Pompilia*, while Hübner considers it a Geometer. I have not yet met this species, which should be easily recognized from its simple markings.

Hemeroplanis pyralis, 23, fig. 127-128.

"Georgia." I took this species in Alabama and identified it Trans. Am. Ent. Soc., iv., 23. It is the type of *Pleonectyptera*, Hübner's generic term being used in the Sphingidæ. Four species are represented in my collection, all from the Southern States.

Anticarsia gemmatilis, 26, fig. 153-154.

"Surinam." I have identified this with a common species taken in Texas by Belfrage and in Wisconsin by Westcott. The figures are smaller than my specimens.

I have previously (Can. Ent., xi., 179) described varieties of this species from Texas and Wisconsin. I wish to add here that this variation takes place only on the upper surface of the wings. Even in their brown ground color the under surfaces are always nearly the same; the common outer line of pale points is always obvious. This illustrates my observations on the method of variation in the Noctuidæ (Pop. Sci. Monthly,

Dec., 1876) in the imago state. In *Anticarsia gemmatilis*, while the upper surface may be brown, gray, or blotchy with black on ochrey, the under surface remains of a dull brown on which the white linear dottings are conspicuous.

NEW NOCTUIDÆ.

BY A. R. GROTE, BUFFALO, N. Y.

XYLOMIGES DOLOSA, n. s.

Professor C. H. Fernald has sent me a fresh female specimen which evidently belongs to an undescribed species of *Xylomiges*, and for which I propose the specific name *dolosa*. The species is black and grayish white, the black dull and lustreless. Eyes hairy, abdomen a little flattened, the tufts are not discernible. Size of *Mamestra adjuncta*. Thorax black, with gray shading on collar and tegulæ; abdomen blackish. Primaries with the ordinary spot grayish white, of the usual size, reniform upright. Posterior line even, double, followed by venular points. Subterminal line even, whitish, preceded by black cuneiform marks. Terminal space gray, veins marked with black. Fringes black, neatly marked with gray. Hind wings whitish, powdered with fuscous, without marks, beneath with a distinct dark discal spot. The species is remarkable for the evenness of the subterminal line, which wants the usual indentations. The wings are rather long and the somewhat depressed body gives it a resemblance to *Lithophane*. It may be ultimately referred to *Mamestra*, but the thorax and abdomen are untufted, the hind wings rather long and with well marked exterior sinus.

MAMESTRA DEFESSA, n. s.

Also allied to *trifolii*, but with the subterminal line irregular and dusky; reniform concolorous with an inferior black stain. The fore wings are pale ochrey clay color, the lines double, faint, stigmata concolorous, with dark defining lines. Thorax concolorous with primaries; no lines on the collar. Hind wings whitish at base with discal lunule and broad exterior fuscous band. Beneath there is a discal cloud and common extra mesial dotted line, which is joined to the discal spot on primaries by

dusky scales along the median nervules. Size of *trifolii*. Two specimens, Santa Clara, California, May 22, collected by Baron Osten Sacken.

This inconspicuous form can hardly be a geographical variety of *trifolii*, as the subterminal line seems quite different in character, but the markings are otherwise very nearly the same.

CORDYCEPS RAVENELII ON THE LARVÆ OF PHYLLOPHAGA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

I am indebted to Mr. P. H. Mell, Auburn, Ala., for this beautiful species. This fungus is described by Rev. N. J. Berkeley in Journal of Proceed. Linn. Soc. Lond., 1856, vol. i., p. 159, pl. 1, f. 4, after specimens in Rev. M. A. Curtis' herbarium, and collected by Mr. H. W. Ravenel in S. Carolina. I was shown by Prof. W. G. Farlow, who possesses now the herbarium of Curtis, the original types, which are identical with those collected by Mr. Mell—as far as identity can be ascertained without making cuts for microscopical examination. Mr. Curtis remarks: "S. Carolina in May; grows out on first joint of thorax on one or both sides of dead larvæ of *Ancylonycha (Phyllophaga)*, buried one to two inches under ground; also from Texas, C. Wright. The fungus is brown. Head two inches or more high, flexuous, compressed or grooved, at first minutely tomentose, at length smooth; head ¾ inch long, cylindrical, but slightly attenuated at either end. Peritheria free, ovate; asci very long; sporidia very long, filiform, breaking up into joints 0,0001 inch long."

It would be impossible to determine the larva from Alabama nearer than as one belonging probably to *Phyllophaga*. All we know of the larvæ of this genus (even of Melolonthidæ) from U. S. is a notice of *Ph. puncticollis* in Sillim. Jour., viii., p. 269, of *Macrodactylus spinosus* and the descriptions and figures of *Ph. fusca*, which are not sufficient. From Europe are some species described, but after all the larvæ of this family need to be worked out and studied entirely as new.

ON CERTAIN SPECIES OF SATYRUS.

BY W. H. EDWARDS, COALBURGH, W. VA.

(Continued from Page 55.)

ARIANE.—I have not seen Dr. Boisduval's type of *Ariane* (many of his types of American butterflies he sent me), but the species is easily recognized by his description. He says it is size of *Phædra* (or like *Nephele*), in color brown-black; the fore wings with two black ocelli pupilled with white and with pale irides; 6 small ocelli on hind wing below, pupilled with white and circled by fulvous; the same wing crossed by two sinuous black lines; the females with large ocelli having yellow-fulvous irides; the small ocelli much less distinct than in the male.

I have received several *Ariane* ♂ and one ♀, taken by Mr. Behrens at Soda Springs, Cal., 1879. These examples agree well with the above description. They are almost black on upper side. Beneath black-brown; the two stripes across disk and basal area of hind wings are heavy and black, standing out clearly on the brown ground, and the fine, abbreviated streaks are distinct from base to the discal stripe. This stripe at the end of the cell curves irregularly outward, and at the summit of the curve is indented angularly. In the other members of this group, from *Pegala* to *Boopis*, there is a similar projection of the discal stripe, but it is rounded and often flattened. Except in this single point, the typical *Ariane* male seems undistinguishable from some examples of *Nephele*. No doubt the latter sometimes will be found to show variation in the outline of the stripe and these two forms become identical. The single female sent by Mr. Behrens has a paler shade over the extra discal area of fore wings; the ocelli have indistinct narrow yellow irides and white pupils. The stripes on under side of hind wings are distinct, and the area beyond is paler and slightly gray; one white dot with narrow black edging on the second median interspace, and a similar one in lower subcostal interspace, are the only traces of ocelli. Dr. Behr mentions an example in his collection in which the second ocellus on fore wing is suppressed. He says the species is wanting near San Francisco, but is found at San Diego and Santa Cruz; also at Mono Lake.

From Mr. O. T. Baron I have received 15 ♂, 2 ♀ of a Satyrus allied to *Ariane*, but differing considerably from Dr. Boisduval's description, and

from the Soda Springs examples. They were taken in various localities in Northern California in 1879. They are not black, or "brown-black," but of a cinereous-brown, a little dusky over the basal area of fore wings; the under side is light brown with a yellow tint throughout, and over the whole area beyond the discal stripe on hind wing there is a gray shade, either whitish or a brown-gray. On this part of the wing the fine dark streaks are obliterated, and the two stripes being heavy and dark, while the intervening space is also darker than other parts of the wing, there is a strong contrast of color between the extra discal area and this so-formed band. The indentation seen in the outer stripe in *Ariane* is here present, but is deeper. The small ocelli are normally six, but in half the examples they are more or less wanting and are always very small. As to the two females, on the upper side they look like the males, but beneath they are considerably more cinereous, and that from base to margin, while the discal stripe (or the outer line of the band) is more broken into crenations. All this is unlike *Ariane* and unlike *Nephele*. While *Ariane* as described may in both sexes be matched in a series of *Nephele*, except perhaps in the single point before spoken of, the indentation against cell in the outline of the band, this form cannot be, and this is as good a test as need be of its distinctness from *Ariane*. I call this *Baroni*, after my indefatigable friend, who has contributed so much to our knowledge of the Californian lepidoptera.

I have recently received from Mr. Morrison, at Olympia, Washington Territory, one ♂, two ♀, close to *Nephele*, and yet showing important differences in some respects. The male, placed by the side of a *Nephele* ♂ from White Mountains, is undistinguishable on upper surface, being of the same black-brown color, with similar ocelli, these having no rings, but white pupils; the anal ocellus on both has a white pupil. Beneath, while the eastern example is brown throughout, the other is largely gray-white over whole surface, but especially at apex and along hind margin of primaries, and over the extra discal area of secondaries. The large and small ocelli are alike in both, the latter six in number. The two females are lighter colored than the male, agreeing with many eastern *Nephele* in this, and also in having a paler shade over the space which in *Alope* is occupied by the yellow band. About the ocelli are hazy yellow rings. On the under side the stripes of hind wings are nearly lost, the basal one totally in one example. One has three minute ocelli, the other four. The color of this surface is brown with a yellow tint, and the apex and hind margin and

extra discal area are suffused with gray more decidedly than in the male. I have seen no *Nephele* of such a complexion, but the general resemblance of the three examples is closer to *Nephele* than to *Ariane*. Whether Mr. Morrison found this form common or not I am not informed, but it seems to have been the only large Satyrus taken by him in that region. I call this variety *incana*.

Gabbii.—The female of this species is of a light yellow-brown on upper side, with a broad, clouded, yellowish band on fore wings, and an obscure yellow shade over the outer half of secondaries. On the hind wing are three and four ocelli in every example which I have seen, the one in lower median interspace largest, and pupilled, and all in hazy yellow rings. On the under side the color is yellow-gray next base, beyond to margin whitish, and the whole surface, from base to hind margin, is streaked uniformly with brown. There is a cloudy stripe across middle of wing, and either none at all or an obsolescent one towards base. The male is darker and without yellow, with two or three ocelli on hind wings, these, as well as the ocelli on fore wings, in yellowish rings. All examples seen, of either sex, have six ocelli on hind wing beneath, generally complete and conspicuous. *Gabbii* flies from Utah to Oregon. On the under side it greatly resembles the Texan *Alope*, but on the upper, by reason of the clouded yellow, is unlike any other species.

Wheeleri.—The female of this species also has three ocelli on upper side of hind wing. The upper ocellus on fore wings in both sexes appears to be always duplex, with two pupils, and on under side of hind wing there are always six ocelli. Of these the middle one of each group of three is long and narrow—lenticular, and not rounded or oval, as in all the other species. Across the disk is a wavy brown stripe, and nearer base a straight one. As this species is figured in Butterflies of N. A., vol. 2, and also in Mead's Report on the Butterflies of Colorado, I do not here describe it farther. Its habitat is south-eastern California and Arizona.

Sthenele.—Dr. Boisduval described this species in 1852 as follows: Upper side brown, with the fringes ashy-gray, cut with black; the fore wings with two ocelli with white pupils; the hind wing without spots. Under side ashy-gray, deepest colored at base; the fore wings with two large ocelli circled with yellow-fulvous; hind wing crossed by a broad angular band and marked towards anal angle by two little ocelli. The

female a little larger, and the ocelli circled with fulvous on both surfaces. No locality given, but spoken of as very rare. *Sthenele* seems indeed to be one of the rarest of the Californian butterflies. Mr. Henry Edwards informs me that all the examples of this species hitherto known in collections are believed to have been taken in a certain locality now included in the limits of San Francisco, and that no other locality is known. Practically the species is extinct. The same is true of Lycaena *Xerxes*, which was taken at same spot with *Sthenele*, but no where else. I have received from Dr. Behr and Mr. Edwards some half a dozen examples of *Sthenele* at different times, of which I now have 3 ♂, 1 ♀. The ♂ expands from 1.3 to 1.4 inch, the ♀ 1.2. The upper side agrees with the above description. Beneath, the fore wing is yellow-brown, with a slight gray shade over outer half. The hind wing is brown just at base and next hind margin, and all the interior part of the wing is whitish, and on this area is a broad angular brown band, unlike anything in our other species. The inner side of this band is circular and is roughly and irregularly crenated; the outer side is sinuous, there being a broad and deep rounded sinus on the subcostal and another on the median interspaces, while between these projects a broad, angular dentation; in one ♂ and the ♀ this is rounded. The ocelli are as described by Dr. Boisduval. This species belongs to another group from those which follow.

Silvestris.—The male expands about 1.5 inch and female 1.5 to 1.6 inch. The former is dark brown, with two small blind ocelli on fore wing, and a black sexual dash along the lower side of cell. The under side is tinted yellow; the two ocelli are large, pupilled white, and with yellow rings. The hind wing has one or two white dots near angle, indicating obsolete ocelli; across the disk a broad indistinct band, not darker than the rest of the wing, its outlines very irregular—on the basal side rather serrated, on the outer side against the cell two long serrations projecting with a sharp and deep sinus between them. The female is lighter colored above, the ocelli larger, pupilled and with a hazy yellow ring, and yellowish nimbus over the adjacent area; there is a small ocellus at anal angle, and the fringes are alternately light and dark, whereas in the male they seem to be wholly brown. The under side is more grayish than in the male, and the markings more distinct. Mr. Baron sent me quite a number of perfect specimens, obtained by him in northern California. In my Catalogue, 1877, I have credited this species to Nevada and Montana, but I am not now sure of these localities.

CHARON.—A little smaller than *Silvestris* on the average, though individuals occur fully as large; dark brown in both sexes. The male has a sexual dash under cell, and a single blind ocellus; the female has two ocelli and about them slight yellow rings. The under side is yellow tinted; the hind wings sometimes, but not always, have a faint gray shade beyond the band; primaries have two complete ocelli, the rings yellow, but often the lower ocellus is reduced to a black dot; the hind wing has from one to six minute ocelli, or points. The band is shaped as in *Silvestris*. The fringes are sometimes wholly brown, but sometimes those of fore wings are mixed with dark gray. This species is common in Colorado at high elevations, and inhabits Montana, Wyoming and New Mexico. I have received a single example from north-eastern California. Mr. Morrison sent me a pair from Nevada, 1877, in which the light part of the fringes is almost white, and the under side of hind wings is much lighter, or more hoary, than usual, the outlines of the band standing out clearly.

PHOCUS.—This form is a modification of *Charon*, a little larger, the expanse being, ♂ 1.6 to ♀ 1.8; the fringes same color as the wings. Under side yellow tinted, but without gray, the band of hind wings frequently wholly absent, but in some examples just enough is discernible of the outer line to show that it is of same shape as *Silvestris*. I have but one ♀, and this has two small ocelli on upper side, in pale yellow rings, and beneath these is no trace of the band The only locality known to me is Lake Lahache, British Columbia, from which I have had several examples, taken by the late G. R. Crotch.

MEADII.—The ♂ expands 1.5 to 1.7, ♀ 1.8 to 1.9 inches. Upper side light brown with a strong russet tint on the disk and the area which includes the ocelli. Two pupilled ocelli and one at anal angle. The under side is brown, sometimes with a little gray on extra discal area of secondaries; the russet shade more decided and covering nearly all of primaries; the ocelli large in fulvous rings; the outline of the band on hind wings like that of the *Pegala* group, with a rounded projection against end of cell; the small ocelli two or three in number. This well marked species inhabits Colorado and Arizona, probably New Mexico.

(To be Continued.)

ENTOMOLOGY FOR BEGINNERS.

SOME WOOD-EATERS.

BY W. HAGUE HARRINGTON, OTTAWA, ONT.

It is to the Hymenoptera that the student must look for the most varied and interesting phases of insect life. Here he finds numerous avocations conducted with much intelligence, and in many families sees strong social instincts developed. It is not, however, of these latter that I intend now to speak, but of a few solitary ones. Even those just entered upon the study of insect life must be fully aware of the continual destruction of our fruit and timber trees, both alive and in process of manufacture, by the boring, wood-eating larvæ of various insects. The loss thus annually inflicted is not uncommonly set down as due to the obnoxious habits of Coleopterous larvæ entirely, but a not inconsiderable part of it is due to similar tastes on the part of insects belonging to other orders. Such are found even among the Lepidoptera, one species of which—*Cossus Robiniæ*—bores half-inch tunnels into the trunks of living oaks, with such deadly effects that Dr. Fitch has stated that: "Of all the wood-boring insects in our land this is by far the most pernicious, wounding the trees most cruelly." In the Neuroptera need only be mentioned the universally renowned *Termites* or "white ants." So among the Hymenoptera are found the common wood ants, constructing elaborate tunnels and galleries. I have selected for the subject of the present paper the *Uroceridæ*, a family in the above order, the members of which in the larval state have tastes and habits in common with the young of our Capricorn beetles. They are stated "to abound in temperate climates where forests of pines and firs prevail." Their popular name—"Horntails"—is derived from a sharp horny point at the end of the body, varying in shape with the different species. These insects bear a considerable resemblance to wasps, and the females carry a formidable-looking boring apparatus, which is often mistaken for a sting, but which at most is only capable of pricking the skin, and discharges no poison, so that they may be handled fearlessly. The possession by the females of this "augur," "borer" or "piercer," has caused much dispute as to the life history of the Horntails and led to their being classed by early writers among the ichneumons.

Reaumur (writing before the middle of the last century), in publishing the results of his investigations on the ichneumons, divided these flies into two classes, according to the position of the *tarriere*, or augur, of the female. The first class comprised the true ichneumon flies, but the second consisted of those now included in the family *Uroceridæ*. He says: "The females of the ichneumons placed in the second class have also, like the others, an augur, but they carry it applied against the under side of the body; ordinarily its end does not project, or projects but little, beyond that of the body; it is lodged in a sheath made of two pieces hollowed like a gutter, and adheres to the body for the first half, and sometimes for more than the half of its length." He regarded them "all as flesh-eaters when they are in the form of worms," adding, "if, however, any fly resembling an ichneumon is found which in the grub form does not feed upon some other insect, it can still be regarded as an ichneumon, but would have to be excepted from the general rule." The old fallacy that exceptions prove the rule has not been fulfilled in respect to these so-called ichneumons, and they have long since been divested of this title. In describing a large species received by him from a traveller in Lapland as one of the largest he had seen, he expresses much astonishment that such a cold country should furnish a larger species than the mild climate of France, because from warm countries, especially from tropical ones, came the largest insects known. The species in question was *Sirex gigas*, which much resembles in size and coloring our large Pigeon Tremex hereafter described. A few years later, De Geer (a Swede) published a valuable series of *Memoires*, confirming and supplementing those of Reaumur. One of these treats of ichneumons, which are divided into nine classes, according to the shape of the abdomen and the manner of its attachment to the thorax. The first class comprised: "The ichneumons of which the antennæ are conical threads, or diminish little by little in size toward the tip, ending in a fine point; of which the body is not attached to the thorax by a thread, but toward the base is of the same or nearly the same size as the thorax, and terminates in a horny, elongated point in the form of a short tail. This tail must not be confounded with the augur and its sheath; it is only a prolongation of the body. The large ichneumon which M. de Maupertuis brought from Lapland and gave to M. de Reaumur, is of this class." This observant naturalist calls attention to the curious mechanism on the hinder wing of these insects, by which the wings, when extended, are so connected as to form a single surface, thus sustaining a more

powerful flight than if they moved separately. The junction is effected by means of a number of minute hooks on the front edge of the wing, which grasp the nervure or vein on the edge of the fore wing. These hooks can be easily seen with a microscope of even low power, and form a very interesting object. On a wing of *Urocerus albicornis* which I have just examined there are thirty-eight of these hooks, giving the edge of the wing the appearance, on a very small scale, of one of those horse-rakes with curved teeth. De Geer informs us that he counted "more than forty upon each hinder wing of a large ichneumon of the first class. Their extremity is not pointed, it is rounded and as large as all the rest. They are implanted in the nervure by which the wing is bordered," and he adds: "I do not recall that M. de Reaumur nor any other author has made mention of this property of the wings." He then proceeds to describe some remarkable ichneumons of which the places of birth were unknown, beginning with a "grand ichneumon of which the abdomen, ending in a pointed tail, is not held to the thorax by a thread; of which the thorax is black, the body half black and half yellow, and the antennæ and legs yellow." Of this insect—*Sirex gigas*—already mentioned by Reaumur, a detailed account is given, both of the male and female. It is styled peculiar to the northern countries, and one of the largest, if not the largest species found in Europe. It is to be seen flying in full day, noisily humming like the hornets and bees, and agitating continually its wings and antennæ like all ichneumons, of which this last feature is characteristic. "I do not know their grubs, nor the place where they live, but the long augur of the female is enough to show that they should lay their eggs in other bodies, like other ichneumons. *It would be curious to know all their history. Linnaeus is mistaken in placing them in the family of the Saw-flies (Tenthredines).*" Yet these insects, whether we consider the shape of their bodies, the formation of the female appendages, or the shape and habits of their grubs, appear much less removed from the Saw-flies than the ichneumons, or in other words, to occupy an intermediate place between these groups. We know that in the Saw-flies the females are provided with a complex instrument for cutting slits in which to deposit their eggs. This instrument consists of six parts, two of which form a sheath for the rest. Of these, two resemble very fine blades, notched on the edge like a saw, and strengthened when in use by the remaining two acting as backs. The saws, when not employed, are enclosed in the sheath and received in a groove on the under side of the abdomen, so as

to be not easily seen. In the *Urocerida* this complex instrument, modified to form a borer, is much larger, projecting generally beyond the body and easily examined. There are still the hollowed pieces which when closed form the scabbard, but the parts which were seen acting as backs to steady the saws, are now joined or welded together into a cylinder, within which are placed two spiculæ or needles corresponding to the original saws. These needles, as fine as bristles, are worked by independent muscles, and can thus be protruded a little beyond the end of the borer, acting like small drills. In the true ichneumons this apparatus is still further modified, and in some species attains a great length. If the piercer of a Horn-tail be extracted from its scabbard and the tip felt with the finger, it will be found appreciably roughened, and even the naked eye shows it to be ridged. Under the glass it has much the appearance of a diminutive augur. The tapering end is notched at close intervals, while on each side the dividing line which runs along the under side of the cylinder are short ridges placed diagonally to the line and forming triangles, with the apex toward the end of the instrument. Early investigators, as has been shown, were unacquainted with the larvæ of the *Urocerida* and concluded them to be insectivorous, and as late as the time of Westwood this view still had adherents. Reliable observations have long since proved them to be wood-eaters, and have established the fact that the borer of the female fly is used not for depositing eggs in other insects, but for drilling holes in wood in which to place them. It is not only in soft wood that these holes are bored, for I have seen the insects at work on such tough trees as elm, oak and beech, both living and dead. The fly stands up upon its long legs so that its body is kept well out from the wood ; the borer is then bent down so as to be at right angles to the body of the insect, and perpendicular to the surface to be pierced. The end is then inserted by pressure accompanied by a movement of the body from side to side, and by such awl-like motions the holes are pierced sometimes to the depth of half an inch or more. Often the insect is unable to withdraw the augur, so firmly has it been worked in, and I have found many dead ones which had thus perished in the discharge of their duty, that of continuing their species. The grubs hatched from the eggs thus laboriously deposited are fleshy and cylindrical, with rounded, horny heads and very strong jaws capable of cutting deeply into the trees infested by them. Indeed, apparently well authenticated instances are recorded of their having perforated lead to some depth, a feat which

several other species of insects have also been credited with. The duration of their life as larvæ has not yet been ascertained, but when full grown they transform within their burrows in a light cocoon composed of silk and sawdust. The perfect insects are generally clad in liveries composed of black, blue-black, white and different shades of yellow, and a description of the largest and most frequently observed of the few species inhabiting Canada will give a good idea of the others. It has received the name of *Tremex columba*, or the Pigeon Tremex, the latter word meaning a maker of holes. Under the name of *Sirex columba* (given by Linnaeus) this insect was figured and described by De Geer as much resembling *Sirex gigas*, except that it was smaller, being only one inch long, while the other was an inch and two lines. But his must have been an under-sized specimen, for I have found their ordinary length to be one and a quarter inches, while some attain to over an inch and a half. The cylindrical body of the female is long and stout, the extremity being rounded and terminated by the usual short tail, which is yellow ; the body itself is black with transverse bands (several broken) of yellow. The head, thorax and antennæ are rust-yellow, with black markings ; the legs a light ochre-yellow with blackish thighs. The borer is black and its sheath rust-yellow. The smoky wings expand about two inches. The male is very much smaller and of different shape, the abdomen being more flattened, while as it is without any borer, it might easily be mistaken for another species of insect.

CORRESPONDENCE.

We are pained to announce the death of one of our active members in the Worcester Natural History Society, Otto R. Gunther, who died suddenly, Feb'y 27, of hemorrhage, at the age of 23. He was interested in many branches of Natural History, particularly that of Entomology, of which department he was Curator. Born of German parents, and inheriting from his father a love for study, and especially the study of Entomology, he had for several years past devoted his leisure hours, both early and late, in this direction. His attention was chiefly directed to Coleoptera, and by his industry in collecting, together with his many exchanges, he has left a valuable collection of well-determined species. He was a congenial companion, exemplary, thorough and systematic in his favorite study, giving promise, if he had lived, of being a prominent co-worker in this branch of science. T. A. D., Worcester, Mass.

NOTES FROM WOLLASTON, MASS.

DEAR SIR,—

During the season of 1878 I have found at this place, situated within two miles of the limits of Boston, some species of butterflies which are seldom found in this vicinity. On the 8th of October I obtained a nice specimen of *C. eurytheme*, which had probably left the chrysalis but a short time before. It was flying in a meadow in company with great numbers of *C. philodice*. The orange-colored tinge of the wings is lighter than on specimens taken farther south. If I am rightly informed, this is the first instance of the capture of this species in this vicinity. On the 29th of June a specimen of *L. arthemis* was taken, and another July 3rd; both specimens had just emerged from the chrysalis. The larvæ evidently fed on the *Quercus alba*, which was very abundant in that locality. A number of specimens of *T. cænia* have been taken here within the last three years, in the month of August or early in September. *Cænia* seems to be rather widely distributed through Massachusetts, and though quite rare, I have found it more common in this vicinity than elsewhere. This species seems to prefer meadows and lowlands to higher ground, and is quite fond of the flowers of the Golden-rod.

F. H. SPRAGUE, Wollaston, Mass.

DEAR SIR,—

In answer to numerous enquiries and a letter in No. 3, all in reference to my letter in No. 2, page 39, regarding the Larvæ of a Cossus, allow me to state that I did not write that letter with a view to publication, but have since corresponded freely with some good authorities on the subject, and am quite sure this Cossus is a new one, much larger than *centerensis* or *robiniæ*. I also learned that the rearing of Cossus in dead wood is likely not to be crowned with success; they require living wood in which sap rises, etc. I have since obtained Cossus larvæ of large size in willow saplings; these I have now growing in large flower-pots, and am likely to be successful with them. I have also found five more trees close to my place of business, literally perforated with this Poplar Cossus. I have also made accurate drawings of this larva and sent them to Dr. Bailey, of Albany, and in due time further articles will appear, likely with illustrations, on the Cossus generally, by his able pen.

A. H. MUNDT, Fairbury, Ill.

The Canadian Entomologist.

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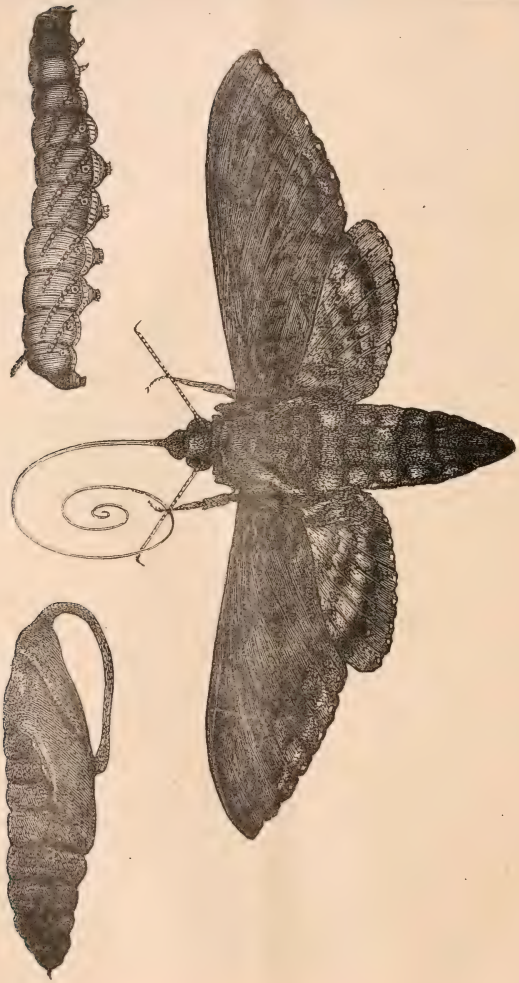
ENTOMOLOGY FOR BEGINNERS.

THE TOMATO WORM (Sphinx quinque-maculata Hawthorn).

BY THE REV. C. J. S. BETHUNE, PORT HOPE, ONT.

Almost everyone, I imagine, has had at some time or other his wonder and curiosity excited by the strange-looking pupa of the Tomato Worm, as it is familiarly termed. It is frequently discovered when digging potatoes in the autumn, or disturbing the soil where tomatoes have been grown. This singular object, which is very correctly represented in the figure, is about two and a half inches long and half an inch in diameter, of a chestnut brown color, and round in shape, tapering towards both ends; from one end, which is the head of the specimen, there proceeds a long curved proboscis like the handle of a jug; the other end is divided into broad rings and terminates in a point. To one who had never seen anything of the kind before this object must at first prove a great puzzle; but a little careful examination will remove some of the mystery. It must be alive, for the tail end moves; but it cannot walk or crawl, and is quite helpless. If we examine it more closely, we find that the rings that move when the creature is touched are very like the rings of a large caterpillar, while at the other end we can trace the eyes, antennæ, and even the short wings of a moth, but all enclosed in a hard brown shell. These things show us that it is an insect in its helpless pupa state; the long jug-handle is the case which contains its tongue for sucking out the nectar from flowers. If we keep it in some damp earth till the next year, there will emerge from it a large handsome moth, of an ashen-grey color, relieved by five bright orange-yellow spots on each side of its body; its wings expand fully five inches in length, and its body is about the same length as the pupa or chrysalis; its tongue is of immense length, about double that of the body—when at rest it is coiled up like a watch-spring beneath the head of the insect. The name of the creature is the Five-spotted Sphinx [*Sphinx (Macrosila) quinque-maculata* Hawthorn].



The larva or caterpillar of this insect, when fully grown, is larger than it is shown in the figure, being as thick as a man's little finger, and over three inches in length. It feeds on the leaves of both the Tomato and Potato plants. It varies so much in color that people often suppose that a number of different species of "worms" are attacking their plants. It is frequently of a bright green marked with white, and having along each side a series of seven oblique greenish-yellow stripes; again it may be found with its general color dark green, dark brown, blackish green, and other shades, even to deep black. On the last segment of the body there is a curved horn or tail. The accompanying wood-cut affords so satisfactory a representation of the three stages of the insect that it is unnecessary to enter into a minute detailed description.

The larva is found feeding during July and August. It often so closely resembles the foliage on which it reposes, the bands on its sides mimicking the ribs of the leaves, that it cannot always be detected; its presence, however, may usually be traced by the singularly marked cylindrical pellets of excrement on the ground and the stripped leaf-stalks of the plant. When fully grown the larva descends into the earth, and there makes a chamber for itself in which to change to its pupa state. Fortunately the insect is not a very common one, its numbers being kept in check by a small Ichneumon-fly; otherwise from its size and voracity it would prove most destructive. Very rarely are more than a few specimens seen in a tomato or potato patch. In the summer of 1878, however, as I recorded in the CANADIAN ENTOMOLOGIST (vol. x., p. 218), it was so abundant that a market-gardener who lives near me gathered four bushels of the caterpillars off an acre and a quarter of tomatoes in one day! That year some of the insects attained to the moth or imago state in October, but generally the pupa remains quiescent in the ground till the following season and the moth appears in June or July. I have now in my possession a living chrysalis of this insect that belonged to the abundant brood of 1878. It was given to me by Mr. David Smart, of Port Hope, who found it, with a large number of others, in his garden. He kept the chrysalids in a box of earth in his cellar all last year; no doubt the coolness prevented the development of the imago. He and I are now both watching with much interest for the appearance of the moths from our specimens, as two years in the pupa state is by no means a common occurrence. That the pupæ are still alive is shown by the readiness with which they move the segments of the abdomen when handled or

disturbed.* Notwithstanding the extraordinary abundance of the larvæ in 1878, there were but few to be seen last year in this neighborhood.

An account of the "Tomato Worm" will hardly be complete without some reference to the supposed poisonous character of the larva. Some ten years ago, when in charge of the Entomological department of the *Canada Farmer*, I took the trouble to trace up some of the stories then very common in the newspapers about cases of poisoning and death from the effects of the bite or sting or venemous spittle of this insect! The result of my enquiries in many instances proved to be exceedingly amusing. In every case I found that no one could give any information whatever as to even the name of the person who was supposed to have died from the effects of this insect, nor could I obtain a single authentic instance of injury from it This was, of course, what was to be expected, as the caterpillar is physically incapable of injuring anyone with its bite—much less with its tail or horn, or imaginary sting. In all probability these stories have originated in the fact that persons have been severely affected by getting some of the juices of the tomato plant into an open cut or sore, and then ignorantly have attributed their trouble to the venom of the ugly but innocent caterpillar.

ANNUAL MEETING OF ENTOMOLOGICAL CLUB, A. A. A. S.

The annual meeting of the Entomological Club of the American Association for the Advancement of Science will be held at the Museum of the Boston Society of Natural History, corner of Berkeley and Boylston Sts., Boston, commencing at 2 p. m., Tuesday, Aug. 24, 1880. It is proposed to send to every member of the American Association, and to all others who may favor the undersigned with their address for that purpose, a circular announcing the special subjects which will be presented at this meeting of the Club; and therefore all entomologists who desire to read communications at that time are requested to notify one of the undersigned before August 1st. This will ensure a fuller discussion of the topics presented, and, it is hoped, a larger attendance.

B. Pickman Mann, *Sec'y*, Cambridge, Mass.
Samuel H. Scudder, *Pres.*, Cambridge, Mass.

* The imago emerged from the pupa referred to on the 27th of May, after being nearly two years in that state.

LARVAL HABITS OF A GOLDEN-ROD BORING PLUME.

BY D. S. KELLICOTT, BUFFALO, N. Y.

The Golden-rods in the vicinity of Buffalo—especially observed on Squaw Island—harbor the larvæ of two plume moths, one boring the branches, stem and root, the other using the foliage. I have sent the moths to Mr. Charles Fish, of Old Town, Maine, for determination; he concludes that they are both unnamed, and he will describe and name them in a general paper in preparation on the American species. As a somewhat more detailed account of their habits than a technical paper will allow seems to be desirable, I have prepared these notes, relating mostly to the borer.

For several years successively I have observed that during the latter half of August the ends of many branches and stems of the Golden-rods in the locality mentioned above began to wither and finally die; on examination I have repeatedly found the cause to be a slender, dull yellow moth's larva. It appears to enter the twig a few inches below the apex, or, as it has grown somewhat after the destroyer began its work, pretty near the end where the tissues are tender. I have not seen the eggs, but should suspect their presence during first two weeks of July, at the growing point. It ordinarily moves outwards, pushing its dust-like fragments out at the point of entrance. The larva, when first examined, August 22nd, was .3 of an inch long; color light yellow, head and shield darker, the oblique anal plate almost black, bearing hairs and hooks, dorsal and subdorsal lines pinkish. By the middle of September it abandons the branches, being then .45 of an inch in length, and bores into the stock a few inches above the ground; it makes its way down the pith into the roots, well under ground, where it passes the winter. I fetched several examples from the fields in January for examination; they were then .58 to .6 of an inch in length, lighter in color, with the longitudinal lines of pink brighter than in autumn, the eighth segment conspicuously marked on the back by pink. There are few hairs over their smooth bodies; on the last ring, however, there is a brown or black chitinous disc, with a circle of long, brown hairs about its circumference; in the centre of this disc there is a small papilla with two stout, straight, black teeth pointing rearwards. These teeth are hooked upwards in the autumn stage. The hairs render the plate sensitive to touch, and help to brush fragments from

their long narrow galleries, while the teeth assist in backward motion in them. The mature larvæ obtained in May differ but slightly from these, except that they are then .7 of an inch long and the pink stripes and marks are brownish. The fourth, fifth and sixth segments are smaller than those preceding or following them. They are quite active, moving up and down their burrows rapidly.

By the middle of May the caterpillar has worked its way back to the place of entrance in autumn, enlarging its way to accommodate its increased size, and after loosely stopping the upper part with a few chips, retires and changes to the pupa. It is then .6 of an inch in length, slender, cylindrical. Color white, except the oblique disc or plate terminating the head, which is made dark by many teeth-like elevations on its surface. The abdominal segments are clothed with hairs, and the last four segments have each a transverse row of teeth on the dorsal part, reminding one of a Tortrix or Cossus pupa. The conical tip of the abdomen has many teeth; these teeth, together with the roughness upon the head, enable the pupa to worm its way up and down the burrow with readiness. When removed from the stem to the table it travels about, rolling and worming its way very much as do the pupæ of certain stem-boring beetles. The wing and limb covers are free for a considerable distance from their tips.

The moth appears from the 1st to the 15th of July; the largest measured expanded 1.2 inches.

This moth has a peculiarly interesting history, increasing much the known diversity of form and habits of the preparatory forms of the Pterophoridæ.

Concerning the smaller one which feeds upon the leaves, I will say that the larva and its habits are too imperfectly known to me to detail; that the pupa is found during the first days of July fastened to the under side of the leaf parallel to the mid-rib. Its appearance is quite like that of the pupa of the best known forms of the group.

ENTOMOLOGICAL NOTES.

BY A. S. MCBRIDE, FREELAND, DE KALB CO., ILL.

I find *Dorytomus mucidus* Say running on and flying about Cottonwood trees early in April and again in August. In October it is found under dead bark of trees, in winter quarters. Common.

Eros coccinatus Say is found in April in the Cotton wood under logs in the woods.

Sphenophorus 13-punctatus H., common on Rag-weed (Ambrosia bidentata) in August. Common.

I have taken *Eburia quadrigeminata* Say in the act of coming out of Hickory trees in July; they fly in the dusk of evening, and are quite common.

Dinoderus punctatus is found early in the spring on fences and buildings near the wood-pile, and I have taken them in great numbers in the stumps of trees that had been grubbed out; sometimes the small roots would be almost entirely reduced to powder.

Bostrichus bicornis Web. is found under the dead bark of White Oak posts in August. I think the larva bores in the wood.

Plectrodera scalator Fab. is found on small swamp Willows in August.

Toxotus cylindricollis Say is found on wild flowers in July; not common.

Epicauta convolvuli Mels. is found on May-weed (Maruta cotula) in August, but not common.

NATURAL HISTORY SOCIETY OF ILLINOIS.

The Illinois State Natural History Society met at the Opera House, in Bloomington, Tuesday evening, Feb'y 24th. After an address of welcome from the citizens of Bloomington, and an address by Prof. A. H. Worthen, of Springfield, Ill., the retiring President, the original officers were re-elected. Various papers and lectures were read before the Society, which adjourned on Thursday, the 26th, having provided for a summer meeting on the grounds of the Lake George Sportsmen's Association, near Chicago, in July. This Society was organized at the Palmer House, in Chicago, in January, 1879, and the Bloomington was its third semi-annual meeting, but it still lacks somewhat in effectiveness for want of the full support that should be accorded by the naturalists of Illinois, its aim being to embrace in its membership every person in the State of Illinois interested in natural science. The officers elected at Bloomington were: A. H. Worthen, Springfield, President; T. J. Burrell, Champaign, Vice-President; S. A. Forbes, Normal, Secretary, and H. N. Hibbard, Chicago, Treasurer.

THE EXCEEDINGLY NUMEROUS APPEARANCE OF A PHRYGANID.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

I received, May 8th, 1880, the following notice from Mr. W. F. Bassett, of Waterbury, Conn. :

"The insects are just now so abundant at Birmingham, on the Housatonic River, that the inhabitants are forced to keep their houses closed as far as possible. Birmingham is at the head of tide water, and the flies are there called shad flies."

The species is *Brachycentrus fuliginosus*, and I can add that its European relative, *B. subnubilus*, has the same habits, and is sometimes very obnoxious in Russia. The cases of the larvæ are very interesting from their quadrangular shape.

ON DESCRIBING LARVÆ.

BY D. W. COQUILLETT, WOODSTOCK, ILL.

In order to secure a greater uniformity in the descriptions of Lepidopterous larvæ taken by different authors, I would suggest the general adoption of the following terms for the various markings and parts of a caterpillar's body : The line in the middle of the back is the *Dorsal* line ; that which includes the spiracles is the *Stigmatal* line ; and the line midway between the dorsal and stigmatal lines is the *Subdorsal* line. That part of the body which lies between the dorsal and subdorsal lines is the *Subdorsal space ;* and that part which lies between the subdorsal and stigmatal lines is the *Stigmatal space.* The under part of the body is the *Venter ;* and that part of the body which lies between the spiracles and base of the legs is the *Subventer.*

If these terms were adopted by every person who describes a larva, his description would be of greater value to economic entomologists than if he were to use terms of his own proposing.

ON CERTAIN SPECIES OF SATYRUS.

BY W. H. EDWARDS, COALBURGH, W. VA.

(Continued from Page 94.)

Conclusion.—The North American species of this genus may be divided into three Groups, with several sub-groups. Group 1 comprises *Pegala* and all the larger species. Group 2 *Silvestris* and others, characterized by their small size, and the peculiar outline of the discal band on under side of hind wings, there being two long serrations against end of cell. This division will throw *Meadii* into Group 1, in which the band has a rounded prominence against cell. Group 3 comprises *Sthenele* only.

It seems to me probable that the species forming the first sub-group of Group 1 have originated with a form either identical with *Pegala*, or very near it, characterized by a rufous band on which was a single ocellus, by an ocellus at anal angle, and six complete ocelli on under side of hind wing. And it may have occupied a considerable territory, at least including what is now the southern tier of States. At present, *Pegala* is restricted pretty much to the vicinity of the Gulf of Mexico, and a strip along the Atlantic coast, at least as far to the north as Charleston, S. C. This is but a small area when compared with that occupied by *Alope* and its co-form *Nephele*. The two species, *Alope* and *Pegala*, are separated by a sandy zone, which the former does not penetrate, and the latter at most but occasionally.

It will be noticed that *Pegala* possesses in perfection many points which are found in one or other or all the members of the sub-group. It is considerably the largest, though occasionally an *Alope Texana* fully equals it. Its peculiar brown color on upper side and gray-brown on lower side passes into *Alope*, which gradually changes into the darker shade of *Nephele*. The rufous band becomes yellow in *Alope*, but breaks out in that species in certain localities, as seen in var. *maritima*. After the band has become suppressed in *Nephele*, every now and then it reappears in greater or less degree, even in *Olympus* and *Boopis*. If the original form presented a single ocellus, that is now a prominent characteristic of *Pegala*, but there has come to be a certain modification, so that in some cases, in the female, there are two complete ocelli, but in many more of both sexes there are dots and small spots in place of a second ocellus. In

Alope and the rest there are two ocelli, not always complete or equal, and occasionally one is suppressed. When this happens *it is always the lower one*, which is wanting in *Pegala*. There is a tendency to variation in the number of these ocelli, a second one sometimes appearing in *Pegala*, but a third one sometimes in *Alope*, and in the last named species and the rest of its sub-group, there are not unfrequently one or two small spots on the fore wings, as of incipient ocelli. The single ocellus invariably seen at anal angle in *Pegala* is often wanting or incomplete in the other forms; and the six ocelli of under hind wing, almost invariably present (but sometimes six on one wing, five on the other—never less, so far as observed), vary from six to nil in all the others.

The fact that the area now occupied by *Pegala* is so restricted shows that the present conditions are not favorable to it. One can understand that in former times, since these Satyrids had possession, the conditions geologic and climatic may have been quite different from what they now are, and that *Pegala* may have occupied a much enlarged area, while *Alope* inhabited parts of the same, or indeed originated with *Pegala* precisely as *Nephele* has originated with *Alope*. In this last case there would have been a series of intergrades between *Pegala* and *Alope*, caused by the interbreeding of the variety and the parent form.

If in the northern belt the conditions were to become unsuited to the support of any Satyrus, and the forms which now occupy it were suddenly to become extinct, we should have to the south *Alope*, and to the north *Nephele*, two good species. The intergrades would have wholly disappeared, or there would be a wide gap in the series, and nothing would be left to show how one form could have originated with the other. *Alope* and *Nephele* would then occupy a position similar to that of *Pegala* and *Alope* now. What might happen by some sudden change of conditions might also happen gradually and come to the same end. If a certain variety, *Alope*, thrown off by *Pegala*, flourished in its larval state on meadow grasses rather than coarse saw grass or sea-side grass, then its tendency would be towards the country which produced the former, and there would be a movement to the north and north-west. At the same time there would be a withdrawing of the parent form from the borders of the original territory, because there the food plant was not in perfection, and so a belt would come to intervene between the parent and the variety. The former would flourish where its food plant flourished, which in this case would be the sea-board. The intergrades which had arisen from

crossing would follow one form or the other, and tend to revert to the parent or to become merged in the variety. Favorable conditions might render one or more of them permanent, as with *Alope Texana*, which seems to possess a territory of its own to the south-west. Certainly the parent form would be more or less modified by the absorption of the intergrades, if not permanently, yet so that now and then sports would be thrown out in the direction of *Alope*. *Hence the two-eyed Pegala*. That, on the other hand, the intergrades nearest the strong variety would tend to merge in it also, when cross breeding had ceased by the disappearance of the parent form, we may infer from the fact that when *Alope* is suppressed the tendency of the species is to the pure type *Nephele*. Wherever *Nephele* is alone found there appear variations in the direction of *Alope*, but they are very infrequent as compared with the typical form.

Alope and *Nephele* are dimorphic in a certain belt of latitude which embraces part of New York and New England, but as I have before intimated, there is a longitudinal limit to the dimorphism also. Somewhere between New York and Indiana *Alope* disappears. There would seem to be a longitudinal belt of considerable width passing through western Ohio and eastern Indiana, in which both forms are either unknown or of extremely rare occurrence, while to the west of it *Nephele Olympus* emerges in Illinois, Wisconsin, Iowa, &c. As before stated, *Alope* is reported to be very rare at Cleveland (eastern Ohio), and unknown at Toledo (north-western Ohio). In the region from Columbus (middle), Dayton and Cincinnati (south-west), *Alope* and *Nephele* are unknown. A line drawn from Toledo through Columbus to Cincinnati would embrace about one third of the State. Dr. Landis kindly undertook to obtain information for me from the collectors in eastern Indiana, and so far as Indianapolis (a little to the east of the middle of the State) he reports both forms unknown. It is true, collectors of butterflies are not numerous, but they are usually very zealous, and each is likely to be well acquainted with his own neighborhood and for a considerable distance around.

I have recently had several letters calling my attention to published lists of butterflies of different western States, in which *Alope* is mentioned as present, and usually both *Alope* and *Nephele*. Such as Mr. Scudder's list of butterflies taken by Mr. J. H. Allen, in Iowa, 1870; Mr. J. Duncan Putnam's list of butterflies found about Davenport, Iowa; Mr. Herbert Osborn's recent list of butterflies about Ames, Iowa; Prof. H. W. Parker's

list of those taken at Grinnell, Ia., 1870, in Am. Ent., 2, 175; also a recent list of butterflies of Illinois by Mr. C. E. Worthington, in Can. Ent. Manuscript lists of butterflies of Illinois and Nebraska have been in my possession for some years, made by Mr. G. M. Dodge. Prof. S. H. Peabody also wrote me of the occurrence of *Alope* in Wisconsin, and sent me examples so labelled, which were taken by him at Madison. I have written to the authors of these lists and had replies from each one, and in most cases examples of the butterflies called *Alope* were sent me. And in every instance what had passed as *Alope* was what I call *Nephele*, nearly always female, a little off type, in some cases considerably so, but never closely approaching the typical *Alope*. There has in no case been *a clear colored yellow band*, but always either a slight discoloration about the ocelli on fore wing, or a more or less hazy, ill-defined, obscure yellow area, such as appears frequently in the dimorphic belt in New York, and which there represents the intergrades between *Alope* and *Nephele*. In the west, *they are not intergrades, because there is no Alope to intergrade with, but what I should call examples of reversion.* I limit the name *Alope* to the typical form. These intergrades, or what would be so characterized in the dimorphic belt, are never found where *Alope* flies alone, or before it has entered the belt; but they appear in greater or less degree wherever *Nephele* flies, whether in Canada or Illinois and westward. Even in California, in *Boopis*, we find occasional examples of same character.

Dr. J. P. Hoy, of Racine, Wisconsin, writes thus: "*Nephele* is the most abundant butterfly on the prairies four miles west of Racine. I have taken many hundreds and never saw a single *Alope*. I took a number of *Alope* in Berkshire Co., Mass., some years ago, and they are all I have. The Wisconsin specimens correspond precisely with those in Ills. When Professors Kirtland and Baird visited me in 1859, we travelled over a considerable portion of the State, taking specimens of natural history. Prof. Kirtland was greatly interested in our species of Satyrus. He first thought it was *Alope*, but under a peculiar form. But when we found a lot of the larvæ he said it was not *Alope*. After, he wrote me that it was *Nephele*, Kirby. You may say that *Alope* is unknown in Wisconsin, and that the form *Nephele* is greatly abundant on the prairies, the most common species in midsummer."

I asked Mr. Putnam whether he had ever seen a typical *Alope* in Iowa, and he replied that he never had, adding: "those which I considered *Alope* in my list are probably intergrades"; and the examples which Mr.

Putnam sent me labelled *Alope* were females of *Nephele*. Mr. J. R. Muhleman, long a collector in Macoupin Co., Ills., writes that he has no *Alope* in his collection and does not know that it occurs there. Prof. S. A. Forbes, of Normal, Ills., writes: "We get *Nephele* here, but not *Alope* in this immediate vicinity. The latter is reported to us from Bureau Co. and also from northern Ills., by Dodge, Worthington and others." Mr. Worthington says: "I have never taken *Alope* typical form in northern Illinois and know of no one who has. In my list of Ills. butterflies I included *Alope* on information of Prof. G. H. French, who says he has himself taken it in southern Illinois. I have doubts about *Alope* being found in Illinois or Iowa. All the Michigan examples I have seen were variations of *Nephele Olympus*." On this I wrote Prof. French, who resides at Bloomington, in south Illinois, and he sent me what he had called *Alope*. It was *Nephele* with a slight yellow haze about the ocelli. This, Mr. French says, was taken 50 miles north of Bloomington, and is the only *Alope* he ever has seen or known of having been taken in southern Ills. Mr. Dodge formerly lived in Bureau Co., Ills., and he writes (in reply to my questions as to *Alope* in Illinois and Nebraska): "I have never given particular attention to these forms, but I am strongly inclined to believe that you are right, at least as regards the species here (Nebraska). At all events, I was particular to collect the varieties here last summer, and those I have sent you represent both forms as found with us." These were either pure *Nephele Olympus*, or a little off type only. Prof. Parker, at Grinnell, Ia., says: "I have not seen at the west, I am sure, the bright-banded *Alope*." Lieut. W. L. Carpenter, U. S. A., who has collected for several seasons about Fort Omaha, Nebr., says: "*Alope* is such a striking species, I have no hesitation in saying that I have never seen it before" (I enclosed an example to Lieut. Carpenter). "If it occurs in the valley of the lower Missouri it must be as a straggler from the east, and a rare visitor, or I should have seen it." Mr. Scudder informs me that at the time the Iowa list spoken of was published by him, he considered the two forms, *Alope* and *Nephele*, as one species.

Therefore, for the States beyond Indiana it seems clear that *Alope* does not fly. If it appears anywhere it would be on the southern side, along the Ohio River, inasmuch as this form does inhabit Kentucky. Indeed the only *Alope* Dr. Landis discovered was taken in Indiana near the Ohio, at South Bend, and that but a single example.

Prof. Cook was under the impression that *Alope* was found in Michi-

gan, but less abundantly than *Nephele*. He sent me several examples, two of which were females, taken at Lansing, and labelled *Alope*, a third, male, from Indiana just south of the State line, was so labelled. All these were *Nephele* with a little yellow about the ocelli. With them was a pure type *Nephele* from Lansing. On writing Prof. Cook respecting these, he replied: "I feel confident that there are no typical *Alope* in Michigan, if none that I sent are such. I have seen several Michigan collections and never one specimen with more yellow than the yellowest which I sent you. Years ago you named for Dr. Miles some of our Lansing '*Alope*.' So you see my authority was good." *

Mr. F. S. Sleeper, of Kalamazoo, Michigan, writes: "*Nephele* pure type is quite common in this locality. I have never seen *Alope* here, but I have one specimen which I captured in Ingram Co. in 1867, which is undoubtedly the true *Alope*." Ingram is the county in which is Lansing, the capital of the State.

Prof. D. J. Higley, of Ann Arbor, writes: "I send a specimen of what I have supposed *Alope*. I think this is not nearly so common as the form *Nephele*. The yellow in the specimen sent is more conspicuous than any I have seen." This example has a clear yellow space just about each ocellus and a ligament of same shade joining the two rings together. Outside is a narrow obscure yellow space. It is to be classed with *Nephele*.

We may say then that *Nephele* alone inhabits the country west of New York to the Rocky Mountains, except that it may be found in eastern Ohio and occasionally in Michigan; and is a second time modified on the Pacific slope, appearing as *Boopis*. The more northern variety *incana* is nearer to *Nephele* type than is *Boopis*, and possibly may prevail to the northward and in Brit. Am. connect with the type. *Gabbii* is nearer to *Alope* than *Nephele*. *Wheeleri* is considerably different from *Alope* or *Pegala*, and I cannot give a suggestion as to its origin. Perhaps it should rank in a distinct group, though I here leave it with *Pegala*.

* It was in 1863 that I named the specimens for Dr. Miles. In 1866 I wrote the paper on these forms which was printed in Proc. Ent. Soc., vol. vi., p. 195. I had brought together a large number of specimens from many localities, and came to the conclusion that *Alope* and *Nephele* were two distinct species, and gave my reasons therefor, but I find that I then classed nearly all the variations (now known to be intergrades) with *Nephele*, using these words: "*Alope* varies comparatively little, and very little in the direction of *Nephele*. The variation of *Nephele* is extreme and in the direction of *Alope*, but with the greater number of variations close to the type. Occasionally one individual more aberrant than the rest reaches farther towards *Alope*," etc.

In cataloguing the series would run thus :

Genus SATYRUS.

GROUP I.

Sub-Group 1.

1. PEGALA, Fabr., 1775.
2. ALOPE, Fabr.
    1. dimorphic form, ALOPE Fabr., 1793.
        var. *Texana.*
        var. *maritima.*
    2. dimorphic form, NEPHELE Kirby, 1837.
        var. *incana.*
        1 sub-species OLYMPUS.
        2 " BOOPIS.
3. GABBII, Edw.
4. ARIANE, Bois., 1852.
5. BARONI, Edw.

Sub-group 2.

6. PAULUS, Edw.

Sub-group 3.

7. MEADII, Edw.

Sub-group 4.

8. WHEELERI, Edw.

GROUP II.

9. SILVESTRIS, Edw., 1861.
    œtus, Bois., 1869.
10. CHARON, Edw.
11. PHOCUS, Edw.

GROUP III.

12. STHENELE, Bois., 1852.

NORTH AMERICAN NOCTUIDÆ IN THE ZUTRAEGE.

SECOND AND THIRD HUNDREDS.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

Anomis erosa, 19, fig. 287–288.

"Savannah." I have identified this species from specimens taken in Georgia and Alabama. Hübner figures the variety in which the wings are orange except the s. t. space. Usually they are terminally darker shaded. The species is compared with *A. exacta*, by Hübner. Mr. Thaxter caught this species in Jamaica, W. I.

Eulepidotis alabastraria, 22, fig. 311–312.

"Savannah." Hübner considers the insect a Geometer. It seems to me that his figure represents a Noctuid related to *Palindia*.

Brotis vulneraria, 23, fig. 319–320.

"Bahia." I have identified this species from a specimen taken by Prof. Hinsdale at Racine, Wisconsin. The species is probably an occasional visitant with *odora* and *zenobia*, and does not breed within our territory. Hubner considers it to be a Geometer, but, I think, incorrectly.

Leucania albilinea, 25, fig. 337–338.

"Buenos Ayres." Gueneé describes under this name our common species *Harveyi* Grote. He says, Noct. 1, 89: "L'individu figuré par Hübner, eqùil a recu du Bresil (?), est beaucoup plus foncé que le mien. Serait-ce une espece distincte?" I find that the costa is uneven in Hübner's figure and also that the pale central shade is more continuous; the costal region is darker, there is no distinct black basal dash, the terminal dark shading is not continued along the cell inferiorly. The division of the blackish shades by a pale shading over median nervure is quite characteristic of *Harveyi*, and the failure to give this in Hübner's figure induces my belief that a South American species will be discovered approaching nearer to Hübner's figure, for which reason I keep the designation *Harveyi* for our N. Am. species.

Eunetis ultronia, 26, fig. 347–348.

"Pennsylvania." This is the species generally known as *Catocala ultronia*.

Argyrogramma omega, 29, fig. 373–374.

"Savannah." Gueneé refers this as a synonym to *verruca*, and probably correctly. Hübner's figure represents a species with a single silvery ringlet and no exterior mark.

Aletia argillacea, 32, fig. 399–400.

"Bahia." I have identified this with the *Noctua xylina* of Say, Proc. Am. Ass. Adv. Sci., 13, 1874. This species seems to have spread from Brazil and Central America to the West Indian Islands, from whence during the last half of the last century it made its appearance in the cotton fields of the United States. Here the cotton plant is an annual, and the insect is brought face to face with a longer winter and a perishable food-plant. From my experiments I believe that in the central (and of course the northern) portions of the cotton belt the fall escaping and hybernating moths perish before the new cotton plant is large enough in the spring to receive their eggs. No experiments have yet substantiated the successful hybernation in any portion of our increasing cotton territory. It seems probable in default of this evidence that the Eastern worms come from the flights of the moths from the West Indies, the Western from south-west continental sources, always supposing that from the advance of cotton growing towards the Mexican frontier a locality has not been reached in that direction where the insect can sustain itself, owing to the relative shortness of interval between the crops or by having an alternative food-plant on which the earliest worms are nursed. It is evident that the cotton plant and the *Aletia* must be studied together to arrive at a true conclusion.

Septis mucens, 9, fig. 415–416.

"Pennsylvania." I have identified this species in Belfrage's Texan collections, CAN. ENT., xi., 206. Gueneé gives Florida as locality after Doubleday, and Pennsylvania probably after Hübner. Has it been taken in the Middle States? Belfrage sends a suffused variety, as I regard it, together with the typical form as figured by Hübner and described by Gueneé. Gueneé refers the insect to *Xylophasia*. It has hairy eyes and I have placed it in *Mamestra*.

Agnomonia sequistriaris, 10, fig. 419–420.

"Georgia." Gueneé refers this species as identical with *anilis* Drury, I think without doubt correctly.

Acdia fasciolaris, 15, 443–444.

"Bahia." I have a specimen exactly corresponding with Hübner's figure, in the ovate pale s. t. spot outside the line, the iridescent white basal patch of secondaries, etc. It differs in these and other characters strongly from *nigrescens*, with which Mr. Morrison has incorrectly united it.

Ogygia imperita, 16, 447–448.

"Labrador." I have a specimen of this species which belongs to *Agrotis*, from this locality.

Auchmis confusa, 25, fig. 495-496.

"Pennsylvania." This species has hairy eyes and I have placed it under *Mamestra*.

Melicleptria tuberculum, 29, 517, 518.

"Pennsylvania." I have placed this species in *Lygranthoccia*.

Tarache ardoris, 34, fig. 551-552.

"Georgia." Guenee identifies this species from Montevideo. I have never seen it. It is possibly not found in North America.

Crochiphora flavistriaria, 35, fig. 555-556.

"United States." Guenee refers this species to *Poaphila*.

Porphyrinia matutina, 35, fig. 557-558.

"Georgia." This is *Alaria gaurœ* of Abbot & Smith.

Agnomonia quadrifilaris, 37, fig. 569-570.

"United States." A common species referred by Guenee to *Poaphila*.

Tarache candefacta, 39, fig. 587-588.

"Pennsylvania." A common species throughout the Atlantic District.

Euthisanotia timais Cr., 39, fig. 589-590.

"West Indies." This species occurs on our Atlantic coast as a visitor borne on the winds. It is my *Philochrysa regnatrix*, Proc. Ent. Soc. Phil., 2, pl. 8, fig. 4.

While Hübner must be cited as authority for the species in the first three Hundreds of the Zutraege, Geyer must be credited with the remaining two, which were issued after Hübner's death.

ANNUAL MEETING OF THE MONTREAL BRANCH.

The seventh annual general meeting of the Montreal Branch of the Entomological Society of Ontario was held on Monday, the 17th May, 1880, at the residence of the Vice-President, Mr. H. H. Lyman.

An interesting paper was read by Mr. Couper on the Milk-weed (Asclepias tuberosa) and some of its insect frequenters. The paper drew attention to the curious fact that the colors of the different insects feeding upon this plant were, almost without exception, red and black.

The Secretary and Treasurer read his annual report, which showed the finances to be in a most satisfactory condition.

The election of officers then took place, resulting as follows :

President—G. J. Bowles.
Vice-President—G. B. Pearson.
Secretary and Treasurer—Geo. H. Bowles.
Curator—F. B. Caulfield.
Council—Messrs. H. H. Lyman, Wm. Couper and Robert Jack.

A short time was pleasantly spent in examining several cases of rare Lepidoptera belonging to Mr. Lyman, after which the meeting adjourned.

Geo. H. Bowles, Secretary and Treasurer.

CORRESPONDENCE.

Dear Sir,—

Mr. W. H. Edwards' note of Oct. 20 recalls a very remarkable gathering of *Danais archippus* which came under my own observation, at Racine, Wisconsin, in the first week of Sept., 1868. The insect appeared in great numbers, and gathered in several swarms about trees in the vicinity. The day was cloudy, but without rain. Shortly after noon the swarms seemed to gather and settled upon a tree in my garden, a well-formed black oak about 15 inches in diameter at the trunk, and perhaps 40 feet high. The swarm covered the southern aspect of this tree so

abundantly that the green of the leaves was quite obscured by the brown of the wings of the butterflies. A few sailed back and forth through the air as if seeking a place to alight, when the wings of those sitting, opening and shutting as if by a single impulse, caused the prevailing color to shift from the dark hue of the upper surface to the lighter color of the lower surface. They remained until after nightfall, but were gone when we looked for them in the morning. No attempt was made to capture or count them, but the swarm must have contained some thousands.

S. H. Peabody, Champaign, Ills.

Dear Sir,—

Our season here is remarkably early; the following insects have been observed on dates named:

Camberwell Beauty, *V. antiopa*.....March 18
Small Blue Butterfly, *Lycaena neglecta*..... "
Cabbage Butterfly, *Pieris rapæ*, emerged from chrysalis in the house.....March 30
Sulphur Butterfly, *C. philodice*.....April 4
Cabbage Butterfly, *P. rapæ*..... "
Green Emperor Moth, *A. luna*, just out.....April 14
Ajax Swallow-tail, *P. ajax*.....April 16
American Silk-worm, *S. cecropia*, just out.....April 18
Currant Saw-fly, *N. ventricosus*..... "
Grape-vine Flea Beetle, *Haltica chalybea*..... "
The Colorado Potato Beetle, *Doryphora decemlineata*.Apr. 11

E. W. Claypole, Yellow Springs, Ohio.

Dear Sir,—

On Friday evening last (25th) while sitting reading, I heard a noise in my breeding box, and on taking it down I saw a fine specimen of *P. cresphontes*, which had been out for some time, as it was full of life. I was afraid that it might be hurt by flitting about, but it was perfectly safe. I am not sure when it went into the chrysalis, but it was late in October. I got the larva on the 11th Oct., and it fed a good while. It is not large, measuring just 3½ inches when set out. My room has not been very warm, and nothing else has yet come out.

Hamilton, Ont., Jan'y 26, 1880. William Murray.

The Canadian Entomologist.

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A NEW ENEMY OF THE BLACK SPRUCE, ABIES NIGRA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

An enemy of Abies nigra sent to me by Mr. C. S. Sargent, from the Arboretum of Harvard University, induced me to compare the literature about the enemies of this tree. To my surprise, all that is published consists of two very excellent papers by Mr. Ch. H. Peck, Albany. One, "The Black Spruce," read before the Albany Institute, May 4, 1875, 8v., pp. 21; the other in the New York State Museum's Report of the Botanist, No. 30. I do not remember to have seen these papers recorded in entomological serials. There are noted two vegetable parasites, *Arceuthobium pusillum* and *Peridermium decolorans*. Of insects are recorded a plant-louse near *Addges coccineus*, and some Hemipterous gall insect; also, two beetles, *Hylurgus rufipennis* and *Apate rufipennis*.

The twigs sent to me contained numerous pale spots, the consequence of some dead leaves, three or more, one near the other. The examination of those leaves showed on every one at the base, sidewards, a small round hole. The interior of the leaf was hollow, in some cases only the lower half, where the enemy had not yet finished the work. I discovered directly a small caterpillar, belonging to Tineidæ and probably to the Argyresthians, as the destructive enemy. The biological collection contains no enemy of the Black Spruce, and no similar destruction of Pines, except a somewhat related twig of Pinus Canadensis, quoted also as probably done by an Argyresthian larva. In Mr. Chambers' valuable list no Tineid living on Spruce is recorded.

The European literature contains only one fact similar to the American. It is recorded that *Cedestis farinatella* hollows the leaves of Pines. But until now no American species of *Cedestis* is known. Probably the moth will be raised and the mystery solved: at all events, I desire to draw the attention of entomologists to this enemy. Perhaps it may be more common than is supposed, Prof. Peck stating as a fact that the Spruce trees in some parts were said to be dying at an unusual rate, as if affected by some fatal disease. To judge by analogies, the attack made by *Hylurgus* and *Apate* is only a consequence of the previous attacks by other enemies.

DESCRIPTION OF PREPARATORY STAGES OF AGRAULIS VANILLAE, Linnæus.

BY W. H. EDWARDS, COALBURGH, W. VA.

Egg—Conoidal, truncated, the top a little arched; the sides more or less convex, varying; the height to the breadth as 9 to 7; marked by 14 straight ribs, which are compressed and elevated, and run from base to top; crossed by about 11 striæ, horizontal, rather prominent; the spaces between the ribs and striæ are quadrangular, the shortest side being with the long axis of the egg; these spaces are depressed and are either flat or slightly convex; the summit is covered with rows of cells, concentric, those of the outer two rows large, hexagonal and irregular, of the third row small, hexagonal; within these are 8 small cells, not depressed, irregularly rhomboidal and forming an eight-rayed star; in the centre a minute star of six rays. Duration of this stage 4 to 5 days.

Young Larva—Length .14 inch; cylindrical, thickest at 4, tapering slightly to 13, the segments well rounded; color brownish-orange, glossy; on either side the dorsal line on each segment after 2 is a row of short, conical, pale black tubercles, and two similar rows on either side, forming transverse rows of 6 tubercles, from the top of each of which springs a short black hair; on 2 is a black dorsal collar, with fine tubercles; feet brown; head nearly globular, flattened on lower front face; color brown; slightly pilose. Duration of this stage about 2 days.

After First Moult—Length .24 inch; same shape; nearly same color, less brown, more orange; armed with six longitudinal rows of long, tapering, black spines, at top sub-conic, each ending in a fine, short, black bristle; a few similar bristles about the spine from base up (for arrangement of the spines, which is uniform in all the succeeding stages, see description of the mature larva); on 2 a dark chitinous collar, broken at the dorsal line, and bearing minute hairy tubercles; feet black; head obovoid, the sides quite convex, the face flattened, the top depressed, and on each conical vertex a simple black process very similar to the body spines, but less tapering and much shorter, pointed at top and ending with a short fine bristle; others disposed about it just as with the spines; a few hairs, long and short, on front face; color chocolate-brown. To next moult 2 days.

After Second Moult—Length .3 inch; color dark (or red-brown) orange, glossy; between dorsals and first laterals a greenish-brown band, not well defined—rather a discoloration, and about segment 10 fading away; the spines long, all black and shining, from black tubercles; those of dorsal rows on 3 and 4 longest, those of first laterals on 2 and 3 nearly as long; collar on 2 black; head as at second stage, glossy black; the vertices rather high, conical; the processes two thirds as long as the dorsal spines on segment 3, irregularly tapering, slightly bent back, conical at top. Duration of this stage 36 hours.

After Third Moult—Length .8 inch; color now dark orange, glossy; a medio-dorsal stripe of olive-brown; a broad band of same hue fills the space between dorsals and first laterals from 2 to 13; the lower part of body also olive-brown, so that the orange is restricted to the dorsal area and lower part of sides; in some examples the band is macular, orange showing in it; head as before, but the vertices higher, and the processes longer and much recurved, resembling horns; face black on front, behind the head orange, but from base of each horn a black stripe passes down the back of the head; on the front are five minute orange spots, one at base of each horn, and three in a cross row below. Duration of this stage 36 to 40 hours.

After Fourth Moult—Length .95 inch; color red-orange, the medio-dorsal stripe greenish, the lateral band pale black, and broadened, so as to come to the outer sides of the tubercles of the two rows; the base same color as the band; the orange restricted to a narrow band running with the spiracles. Twenty-four hours after this moult the length was 1.2 inch, and one day after this was 1.5 inch.

Mature Larva—Length 1.5 inch, greatest breadth .24 inch; cylindrical, thickest at segments 3 to 5, tapering to 13 very gradually; furnished with six rows of long, tapering black spines, bluntly conical at top, from which springs a short and fine black bristle; a few similar bristles irregularly placed about each spine from base to top; two of these rows are subdorsal, and on middle of either side is one, and one below spiracles; the dorsals extend from 3 to 13, the first laterals from 2 to 12; the lower laterals from 6 to 13; over the feet on each side of 2, 3, 4 is a black tubercle with hairs; the spines of dorsal rows on the anterior segments are longest, measuring .16 inch; the first laterals are quite uniformly .11

inch, and the second laterals .9 inch ; color red-orange, with a broad medio-dorsal band of greenish-black, and a broad, slate-black band which occupies the space between the dorsals and first laterals, and reaches to the farther sides of and embraces the tubercles of these rows ; the base of body slate-black, so that the orange is restricted on dorsum to two narrow stripes lying between the dorsal and the two lateral bands, and to another stripe running with the spiracles (these bands widened much after the moult and as this stage proceeded), the whole upper surface highly glazed ; feet and legs black ; head obovoid, deeply cleft, with high conical vertices, on each of which stands a stout spinous recurved process, .15 inch long, black, in all respects formed like the body spines, except that it is less tapering, the upper two thirds being of about uniform size ; the tip conical and giving out a short fine bristle ; a few other like bristles about the sides ; sides and back of head rounded, but the front much flattened ; sparsely pilose ; color of front black, with two vertical orange stripes, one on either side of and very near the suture ; color of hind head, between the horns and down the sides greenish-yellow, the lower part of the side black ; also a black stripe runs back from base of the horn. There was some variation in color at maturity ; some larvæ had a gray line or stripe below spiracles ; on one this line was white and extended the whole length, in another it disappeared at 5 ; the color of the dark band on upper part of side was greenish-black, or slate-black, varying with the point of view. From fourth moult to suspension 59 to 72 hours ; from suspension to chrysalis 13 to 15 hours.

Chrysalis—Length 1.05 in.; depth from dorsal to ventral side .34 in.; breadth at base of wings .26 in.; breadth across abdomen .2 inch ; long, slender, the thorax much compressed laterally, and the wing cases very prominent, forming a narrow carinated hunch, which rounds abruptly on posterior end ; head case high, cylindrical, compressed transversely, the top sloping on the ventral side at about 45° ; on each vertex a short (.05 in. long) ear-like process, excavated on the dorsal side, and crenated at the top ; between these the top of head is twice incurved ; at the base of head case, on dorsal side, a depression ; the mesonotum large, prominent, compressed, carinated, followed posteriorly by a deep and broad depression ; wing cases smooth, a little flaring at base, depressed in middle ; abdomen slender and tapering ; a row of minute medio-dorsal tubercles, and on either side of these a row of large, rounded ones, those of the

anterior segments largest of all, and compressed laterally; colors very variable; some examples are buff with greenish markings, or on the abdomen greenish-brown; the head and wing cases buff, the former with a slight red tint; on the depression at base of head case is a patch of clear pale pink on either side the dorsal line, and between, as also at the outer edges of these patches, is a little black; top of head case pink and black, the processes dark brown at top and on dorsal side; mesonotum buff mottled green, as is the dorsal side of abdomen; wing cases buff, with a greenish patch on middle and a stripe running with one of the interspaces of the wing next margin; on side of abdomen a reddish-buff stripe and below this a broad greenish-brown band; on ventral side a clear pink patch from end of wings down. Some were very black, the wing cases and anterior parts mottled in light and dark black; some had the wing cases, mesonotum and head case pink tinted, mottled all over with greenish-black; the ventral edges of wing cases clear pink-buff; in all examples the two pink spots at base of head case and the stripe on abdomen appear, and in all there is a black angular inscription like figure 3 or like V, on the ventral side of the wing case about one-third the distance from base to end.

On 24th June, 1879, I received from Mr. Jacob Boll, Dallas, Texas, several larvæ of *Vanillae*, some of which had hatched en route, others in stages up to near third moult, and feeding on Passiflora. These larvæ passed their changes with great rapidity. Eggs laid 19th June hatched 22nd or 23rd; larvæ passed first moult 25th, second moult 27th, third 29th, fourth 1st July, pupated 5th, and the imago appeared 12th July. So that the whole round in one case was 23 days. In another but 21, the time between the moults from first to fourth being 40, 42 and 59 hours. I had Passiflora growing near by, so that food was plenty and the weather was hot, and these changes proceeded as they might have done in the tropics. The only species of butterfly which I have known to pass its stages so rapidly has been D. *Archippus* of the midsummer brood. The larvæ of *Vanillae* have six rows of spines, longer and slenderer than in Argynnis, and the bristles which surround them are much shorter and finer than in Argynnis. And the head spines are of same character as those of the body. When ready to suspend, the larva spins a button of white silk, and hangs at first straight, the anterior segments bent on segment 5 at a right angle. After a few hours the back curves in somewhat, and the head is lowered till at last it is almost in line with the body. The whole

upper side turns dead white, except that here and there a faint bit of red or dusky black is seen. When the skin splits it is on 3, the rent extending to 2 and 4, and it is shifted off just as in Grapta. At first the pupa is unformed, but the wing cases creep up one segment, the dorsum becomes hunched, and the head case and mesonotum swell out as in Limenitis. Every one of these chrysalids finally took a twist to one side, bending on the last segments instead of hanging straight down, as is usual with the species of Nymphalidæ known to me.

The curious differences in color of the chrysalids I have noted in the description. Later in the season by four months, I received about forty chrysalids from Prof. Gibbes, from S. Carolina, which varied in same manner as the Texan examples, but the dark varieties much predominated.

On two occasions single examples of *Vanillae* have been taken here at Coalburgh, but it cannot be a permanent resident. It abounds in the Southern States, where brood after brood must follow from early in the season till late in the fall. Fortunately it seems in the larval state to feed on nothing but Passiflora, or it might become a pest.

Abbot figured this species in Insects of Georgia, with larva and chrysalis. The larval body bears considerable resemblance to nature, but the spines look like feathers; they are red, moreover, instead of black. The shape of the chrysalis is good, but the color is not like any which I have seen, being dark brown instead of black.

FUNGOID DISEASES OF INSECTS:—A RECLAMATION.

BY JOHN L. LECONTE, PHILADELPHIA, PA.

The following extract is from the *American Entomologist*, vol. iii., p. 138 (June, 1880):

". . . . in which article, by the way, may be found the first "suggestion that we are aware of in this country, of the practical utili- "zation of fungus diseases, so that Walsh really anticipated LeConte in "this suggestion."

The article of the late B. D. Walsh referred to (*Practical Entomologist*. ii., p. 116, Aug., 1867) contains this passage in reference to a gigantic

Sphaerian fungus which grows out of the larvæ of *Lachnosterna fusca* and other Scarabæidæ :

" If only a single such specimen as the above had been met with, we " might account for it by supposing that the larva had accidentally died " with the undevoured seed of some plant in its mouth, and that this seed " thereupon vegetated and grew, using the body of the plant as manure to " aid it in its growth. But how can we account for the large numbers of " these specimens found in one place, at one time, and by one man ? I " can only explain these singular circumstances by supposing that some " particular kind of seed is poisonous to this larva, although the instincts " of the larva do not prompt it to reject such seed as food. Hence it is " to be hoped that Mr. Paulding's experiments will be continued until he " clearly ascertains what plant is produced from this vegetative larva. " Possibly we might turn such knowledge to practical account by sowing " this particular kind of seed in places infested by the White Grub, and " especially where, as with young trees in nurseries, we cannot conveni- " ently reach our enemy with the plough, the hoe or the spade."

In August, 1873, at the Portland Meeting of the Am. Assoc. Adv. Science, after giving an example of the destruction of the entire caterpillar population of a 12-acre lot of forest land, by the accidental introduction of pebrine, or muscadine, from a neighboring colony of silk worms, I spoke as follows, recommending at the end of my discourse :

" 7. Careful study of epidemic diseases of insects, especially those of " a fungoid nature ; and experiments on the most effective means of intro- " ducing and communicating such diseases, at pleasure."

The want of logical connection between these extracts is sufficiently obvious. But in order to place this more clearly before the reader, let me in a few words sketch the pictures presented to the mind by the respective conceptions of Mr. Walsh and myself.

Mr. Walsh exhibits an uninstructed, though intelligent farmer, seeking under his advice for the imaginary seed of an impossible plant, to be strewn on the ground in places infested by the White Grub, in the fond hope that the latter (in his roving hours ?) may swallow this seed and die of indigestion.

My picture is of a well trained mycologist, skilled in the recognition of microscopic forms, acquainted with ferments and their methods of growth, familiar with the protean forms of zymosis, so far as they have

been traced to organic germs—in few words, a first-class scientific student, who, after careful investigation of the fungus-killed insects brought to him by the "practical" entomologists, shall inform the latter of the nature of the fungi, whether they are transmutable or fixed in structure,* how they can most advantageously be cultivated, and in what vehicle they can best be distributed when needed.

Is there any resemblance between these two pictures?

A MYSTERY IN REFERENCE TO PRONUBA YUCCASELLA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

June 6, 1880.

Last summer Dr. Geo. Engelmann saw some parts of the biological collection here, and was so kind to promise me his help to obtain some species, which I was very eager to possess, viz., *Pronuba yuccasella* in its different stages, and *Phylloxera*. By his request, I received through the kindness of Mr. Thos. Meehan, in September, two bundles of the stems of *Yucca filamentosa* and *angustifolia*. The latter species, after a careful examination of every stick, was found to be entirely free of insects or larvæ; but the former contained many numerous small green larvæ in silky cocoons (and no other kind of larva), placed through the whole length of the stem and in every direction. I compared the larva with Mr. Riley's figure and description of *Pr. yuccasella*, and as both disagreed —the larva having *no legs at all*—I believed it to be a new Rhynchophorous larva at least unknown to me, and wrote accordingly to Mr. Thos. Meehan. Having placed some larvæ in alcohol, I postponed further investigation until they would be more advanced; but they lived through the whole winter, and did not increase in a marked manner.

How was I surprised when, in May, I found in the jar where I kept the stems two moths of *Pronuba yuccasella*! I believed at first that I had overlooked their larvæ, and that, after Mr. Riley's description, they had

* As this is a subject of which little is known, it offers a most promising field for squabbling, and in fact is being already cultivated for that purpose, with prospects of an abundant crop of prematurely expressed opinions.

gone in the earth and now transformed. But the two chrysalis skins were there, and not in the earth, but in the stick, the abdomen *still in the silky cocoon of the larva* before mentioned. I was more astonished that the pupa skins were perfectly smooth on the dorsum, and showed in no way the dorsal arcuated plates with blunt flattened projections, as described by Mr. Riley. I believed at first—as at any time when my observations disagree with those of other scientists—that I was mistaken or misled by some curious event. I compared the moths again with typical specimens, and there was no doubt that both are *P. yuccasella*, with its long pointed maxillary palpi. I examined the jar carefully, but I failed to find other chrysalis skins than the two mentioned before, and I failed to find any other moth in the jar which could have transformed out of the skins. The Yucca sticks were kept *alone and entirely isolated the whole time*, in a large jar, in which nothing else had been raised before. The case seemed to me so mysterious that I decided to wait until more moths would transform. But to this date (June 6—now July 1) none have appeared, and in splitting some sticks I found the larvæ living as briskly as before, and was not able to find any chrysalis, as I failed to find any in May.

I wish to give at least a notice of this remarkable fact, the more remarkable as *Y. filamentosa* is said not to be fructified by *Pr. yuccasella*.

June 10.

This moment I see Mr. Riley's article on *Prodoxus*. His remark (p. 142, Am. Ent.) that I have not been willing to send a specimen, is true, but he has forgotten to add that I wrote to him: "Because I was studying the insect myself, and was about to publish it."

I had decided to drop my article had I not in the study of the two female imagoes at hand found that the basal joint of the maxillary palpi *is produced* in a spinous tentacle just *as in Pronuba*. Therefore the only distinctive character mentioned by Mr. Riley is not present in my specimens; consequently my specimens can not be *Prodoxus*, if Riley's description is correct. The specimens from Colorado types of *Pr. yuccasella* Chamb. possess pointed maxillary palpi. Three of them have no spots on the wings (the two raised by me have also no spots). The ovipositor of one is exposed as in *Pr. yuccasella*. I don't know which species Mr. Boll has now at hand, but the type of *Teget. alba* Zeller from Dallas, Texas, is *Pronuba yuccasella*.

ENTOMOLOGY FOR BEGINNERS.

MIGRATORY INSECTS.

BY G. J. BOWLES, MONTREAL, P. Q.

The migratory instinct, common to so many species of birds, and even of mammalia, is also exhibited by many species of insects. In the case of birds and animals it has mostly to do with variations of climate, or the necessity of suitably providing for the raising of their young ; in the case of insects the causes of migrations are not so evident, and observation is required in order to decide the point, if, indeed, it can be decided at all. The subject is still in obscurity, though the efforts of American Entomologists have thrown a little light upon it with regard to some species. And it is of great interest, not only to Entomologists, but also to tillers of the soil, as some of the insects which exhibit this migratory instinct are among the most injurious to the crops of the farmer and fruit grower.

THE LOCUST.

Chief among the migratory insects stands the locust, considered as a group. On each of the continents, both of the old and new worlds, some species of the locust tribe have from time to time been notorious for this habit, not only on account of the countless numbers in which they have appeared, but also on account of the terrible destruction they have caused. As far back as the time of Moses their ravages are mentioned, for one of the plagues brought upon Egypt just before the departure of the children of Israel was the plague of locusts. In Asia, Africa and Europe their invasions have been recorded in history, both ancient and modern. To show the magnitude of the effects consequent on their migrations, I give a few instances, as taken by Dr. Packard from different historical sources. The first account, after Joel in the Bible, whose descriptions apply to Egypt, Syria, Palestine and Asia Minor, is the statement of Orosius that in the year of the world 3800 certain regions of North Africa were visited by monstrous swarms ; the wind blew them into the sea, and the bodies washed ashore "stank more than the corpses of a hundred thousand men." Another locust plague, resulting in a famine and contagious disorders, according to St. Augustine, occurred in the Kingdom of Masinissa, and caused the death of about 800,000 persons. Pliny states that the locusts visited Italy, flying from Africa. In Europe

locust invasions have been recorded since 1333, when they appeared in Germany. Mouffit states that in 1478 the country about Venice was invaded, and 30,000 people died of famine. In France swarms appeared at the close of the Middle Ages. In 1747 there was a great invasion of Southern and Middle Europe. Before and after this date vast swarms were observed in Asia and Africa. In Russia, whose southern plains form the home of the locust, vast numbers have often appeared and done great damage. In China records exist of the appearance of these insects in devastating numbers 173 times during a period of 1,924 years. The three great causes of famine in China are placed as flood, drought and locusts.

The new world has also its migratory locusts, equally destructive with those of the old. The Rocky Mountain Locust, of which we all have heard so much, is not the only species. Central and South America have also their peculiar locust. Their ravages have been noted by the old Spanish chroniclers of Mexico and the adjacent countries from the time of the first conquest. In 1632 parts of Mexico were overrun with them, and in 1738 and '39 there was an invasion by them of the coasts of Oaxaca, after which a famine occurred in Yucatan. In 1855 and '56 Honduras and Guatemala were invaded, and a famine and pestilence of fever followed. And in 1835 Chili and the eastern part of South America were infested with vast swarms of locusts.

The Rocky Mountain Locust *(Caloptenus spretus)* having been a subject of observation by the most eminent Entomologists of the United States, we know more about its habits and economy than about those of any other species. The terrible devastations it has committed in the Western States have led to this result. When an insect destroys the crops in one year to the estimated value of $45,000,000, it is about time to study its history and habits. Mr. Riley has published a most interesting book on the subject, and from this I have culled a few of the most striking items. Its home is on the elevated plateau of the Rocky Mountains, whence it migrates in favorable seasons to the west and south for hundreds of miles, laying waste the crops wherever it alights and doing terrible damage. It breeds in the regions to which it migrates, and the next generations migrate again north and west towards the "metropolis" of the species, and gradually die out on the way, while those that remain in the place of their birth also die out, so that the species becomes extinct in these localities in a few years.

The observations made, so far, give no special reasons for these migrations, unless it be the unusual abundance of the species and the consequent scarcity of food in its native regions. One or two favorable seasons cause the insect to increase to an immense extent, and when they find the supply of food failing them, they mount into the air in countless millions, and, favored by a westerly or north-westerly wind, sail off towards the settlements in search of "fresh fields and pastures new." Such is the principal reason given by Packard, though he says possibly the reproductive instinct may also be concerned. And he does not think that these movements can be the result of a real migratory instinct, because their migrations (as well as those of the locusts of the old world) are periodical, long intervals sometimes existing between them, so that the development of a migratory instinct would be impossible. If once partially implanted, the long succession of non-migratory years would effectually break up the germs of such an instinct.

Another curious fact in connection with these locusts is, that the generation born in the region to which the species has migrated the previous year, shows a tendency to return north and west towards the primal habitat. This has been proved by repeated observation. One reason for this is found to be the prevalence of favorable winds at that particular season in the regions where these locusts are produced; for locusts, and indeed, all migratory insects, are dependent to some extent upon the winds for assistance and direction in their migrations. This is true for locusts all over the world; they are brought by the wind and taken away by the wind. A striking instance of this fact is given in the account of the great Egyptian plague of locusts, in the Book of Exodus.

So with our American migratory locust. The general direction of the winds on the eastern slopes of the Rocky Mountains and on the plains is, during July and August, west or northwest. These are the months during which the locusts come down from their mountain home to invade the cultivated plains of the border States. And when the generation of which these are the parents attain the winged state, in the following June, it has been found that the prevailing winds are from the south and south-east, and thus are favorable to the flight of the locusts in a northerly or westerly direction

As regards their powers of flight, it has been proved by experiment that the locust, when it has a favorable wind (and it rarely flies at any other time), does not fly faster than the wind, but merely uses its wings to

sustain itself in the air, and allows the breeze to waft it along. An observer proved this by ascending to the top of the State University of Nebraska, when a swarm of locusts was passing, and letting loose among the flying grasshoppers small bunches of cotton. He found that the cotton sailed along quite as fast as the grasshoppers did.

Their numbers are inconceivably great. A British officer who saw a swarm in Syria estimated their number at 180,000,000,000,000. The clouds of them seen in the West have often exceeded 50 miles in length by 20 in breadth, with a depth of from a quarter of a mile to a mile; 1,500,000 bushels of their dead bodies were estimated to be lying on the shores of Salt Lake, in Utah, after a visitation of their hordes. And their eggs are found in the ground in numbers of from 100 to 15,000 to the square foot, in localities favorable to their deposition. Such are some of the reliable statistics gathered regarding the Rocky Mountain Locust.

b

Fig. 19.

This locust is a near relation of our common Canadian locust *(Caloptenus femur-rubrum)*, fig. 19. The latter has often been injurious to the crops, particularly of grass and hay, but has little tendency to migrate. It has a vast range, from Labrador to the Pacific coast, including the Western States and Mississippi Valley as far south as 35°.

A curious and fortunate fact with regard to the locust is that it does not become acclimated in the regions to which it migrates. The hordes from the North, fresh from the invigorating air of the mountains, are much stronger and more vigorous than their progeny, born the succeeding year in the plains of Missouri and the other Western States. Prof. Aughey, of the State University of Nebraska, tested their muscular strength by attaching their hind legs to a delicate spring balance and observing the degree of strength they exerted. He invariably found that the locusts from the mountains were stronger than those born in the plains. He also found that the mountain insects could live without food for several days longer than the others. Their eggs are also injured by the moister climate, so that it is estimated that fully one-half become addled and never hatch. These circumstances tend to so reduce their numbers in the new habitat that in a few years the species dies out.

Leaving the locusts, we will pass to the more pleasing duty of noticing

some migratory insects which are comparatively harmless, and are far more beautiful than any of the Orthoptera.

Many of the butterflies are inclined to migrations, particularly the whites and yellows (*Pieris*, *Colias* and *Callidryas*). These genera, with a few exceptions, are not very plentiful in temperate regions, but have their home in warm climates. So from equatorial and South America, and from the southern parts of Europe, have come reports of vast migrations of these butterflies. Bates, in his "Naturalist on the River Amazon," gives an interesting account of the uninterrupted procession of butterflies belonging to the genus *Callidryas* which he saw passing from

Fig. 20.

morning to night in a southerly direction across the Amazon. In these cases migrations may perhaps be connected with the question of food, or of the continuance of the species.

A butterfly which is well known in Canada, and which has a very wide range, is noted for its migratory habits ; it is the *Danais archippus*, fig. 20. Hardly a season passes but we read of its migrations. Newspapers in the Southwestern States, and the weather signal officers, were constantly reporting the passage over Iowa, Kansas, Missouri and Texas of swarms of this butterfly during the months of September and October last. Even in Canada they are sometimes seen in great numbers on their way either north or south. I myself have seen the shore of Lake Ontario, near Brighton, strewn with hundreds of their dead bodies, cast up by the waves, and which no doubt had formed part of a swarm which from weakness or some other cause had perished while flying across the lake.

Mr. Riley gives an interesting account of the causes which may lead to the migrations of this butterfly in his 3rd Report. He says : " It would be difficult to give any satisfactory reason for this assembling together of such swarms of butterflies. As I have abundantly proved by examination of specimens, the individuals composing the swarms of our Archippus butterfly comprise both sexes ; if anything the females prevail. The flights almost always occur in the autumn, when the Milk-weeds *(Asclepias)*, upon which the larva of this butterfly feeds, have perished. The instinct to propagate is, therefore, at the time in abeyance. The butterflies, unable to supply themselves with sweets from flowers, are either attracted in quantities to trees that are covered with honey-secreting plants, or bark lice ; or else they must migrate southward, where flowers are still blooming. The Archippus butterfly hibernates within hollow trees and other sheltered situations. Southerly timber regions offer most favorable conditions for such hibernation. Under the most favorable conditions a large majority perish. A small portion of the females survive the winter. Such hibernating individuals, upon waking from their winter torpor, make at once for the prairie, where the Milk-weeds most abound. Faded, and often tattered, they may be seen flying swiftly over such prairies.

" I have no doubt but that they travel thus for many hundred miles, keeping principally to the north, and ere they perish, supplying the Milk-weeds here and there with eggs. A fresh brood is produced in less than a month, and these extend still farther north, until we find the species late in the growing season as far up as the Saskatchewan country, where it can scarcely successfully hibernate, and from whence the butterflies instinctively migrate southward. We can thus understand how there are two, three or more broods in southerly regions and only one towards British America.

" The exceptional flights noticed in the spring, and which, so far as recorded, take place quite early and in the same southerly direction, find a similar explanation. They may be looked upon as continuations of the autumn flights. Hibernating in the temperate belt, they are awakened and aroused upon the advent of spring, to find the Milk-weeds not yet started, and they instinctively pass to more southern regions. There is a southward migration late in the growing season in congregated masses, and a northward dispersion early in the season through isolated individuals."

It will thus be seen that Mr. Riley looks upon the migration of *D. archippus* as something analogous to the southern movement of the birds

on the approach of winter, the object in both being the preservation of the species ; in the case of the insect to obtain a suitable place for hibernation, as well as a continued supply of food until the time of hibernation arrives ; in the case of the bird to secure food when it would be difficult or impossible to get it in a northern climate. The instinct of the butterfly might therefore be looked upon as a true migratory instinct, in contradistinction to that of the locust, which is of a lower order.

There is another butterfly which displays this instinct to a large extent. I refer to the well-known *Pyrameis cardui*, or Painted Lady. It is a cosmopolitan butterfly, being found in all parts of the world—a result, no doubt, of its migratory habits, conjoined to a faculty of acclimatization. Though I have never actually seen a migration of this insect, I have had no doubt for years past that one did take place in the vicinity of Quebec, I think in 1865 or '66. I had been looking out for the insect for several years, but never saw a single specimen till one summer, when it suddenly became the most common butterfly in the neighborhood. They could be seen by dozens everywhere. Next year it was not to be found, nor did it return during my stay in Quebec, up to 1872.

I have an idea that others of the genus *Pyrameis*, as well as the species of the allied genera, *Grapta* and *Vanessa*, have these migratory habits to some extent. The same phenomenon, that of scarcity, then extreme abundance for one season, and then disappearance, took place with regard to *Vanessa j-album*. They were so abundant one summer that I even saw them drinking spruce beer from the old applewomens' kegs on the Upper Town Market, Quebec, while next season the only specimen I found was a poor dilapidated individual which I took snugly tucked away under the coping of a fence, where it had evidently passed the winter.

As I said before, the fact of *Pyrameis cardui* being found in all the four quarters of the globe is no doubt due to its migrating propensity. A further proof of this is found in the well-known fact that our *archippus*, originally confined to America (though ranging from Canada to Bolivia), has lately spread over some of the islands of the Pacific to Queensland and New Guinea, and over the Azores to Europe, such extension of habitat necessarily indicating great power of long sustained flight. Since the Milk-weeds are not plants of commercial value, it is highly improbable that the species has been carried in any of its preparatory states in ships. The fact remains, however, that it has been found as a new inhabitant of those countries. Its powers of flight will hardly be doubted by any one

who has attempted to catch it on the wing. But a stronger proof some of you have had in the exhibition of a *D. archippus* some years ago, by Mr. Pearson, of Montreal, which had been captured on board a ship on the Atlantic, hundreds of miles from land.

EARLY APPEARANCE OF CATOCALAS.

BY JAMES S. JOHNSON, FRANKFORD, PENN.

Several of your correspondents have given you articles on the early appearance of Lepidoptera this season, and as the Catocalas are my favorites, I will give my experience with them. According to good authority and report, *C. epione* had the honor of being the first to appear-but I find in this locality a very strong argument against that theory. By referring to my diary I see that *C. ilia* has the precedence. The appear, ance of these two species during five years is as follows:

1876,	July	11th;	C. ilia,	2 examples.
"	"	20th;	" epione,	1 "
1877	"	9th;	" ilia,	2 "
"	"	17th;	" epione,	2 "
1878	"	8th;	" ilia,	2 "
"	"	28th;	" epione,	1 "
1879	"	10th;	" ilia,	1 "
"	"	19th;	" epione,	1 "
1880,	June	24th;	" ilia,	4 "

With this reference we find *ilia* the first, and its appearance this year sixteen days earlier than usual. During the season of 1877 I took 29 species, 461 examples (article in *Field and Forest*, vol. iii., p. 64). This year bids fair to exceed that take, viz.,

1880,	June	24;	C. ilia,	4 examples.
			grynea,	1 "
	"	25;	ilia,	5 "
			insolabilis,	2 "
	"	26;	ilia,	3 "
			insolabilis,	1 "

1880, June	27 ;	C. ilia,	5 examples.
		grynea,	1 "
		linella,	1 "
"	28 ;	ilia,	28 "
		insolabilis,	3 "
		serena,	2 "
		grynea,	3 "
		linella,	1 "
		flebilis,	1 "
		minuta,	1 "
"	29 ;	ilia,	16 "
		grynea,	3 "
		insolabilis,	1 "
"	30 ;	ilia,	4 "
		grynea,	1 "

Total for the week, 7 species, 87 examples. I have not seen an *epione* yet. About one-third of the captures are cabinet examples. I take this as a fair criterion for the appearance of Catocalæ in this locality, as the captures were all made in the same pieces of woodland.

SOME NOTES ON COLEOPTERA FOR BEGINNERS.

BY C. G. SIEWERS, NEWPORT, KY.

In answer to a query in the March ENTOMOLOGIST as to the rearing of larvæ of wood-boring beetles, I would say that it is very difficult to do after they have been removed from their burrows. Try damp sawdust of the same wood. The better plan where infested timber is found, is to saw it into short lengths, pack in tight box and cover with a wet cloth. Many kinds cannot bore in dry wood. Many Buprestidæ perish from inability to perforate the bark of dead trees which has sprung loose from the wood and become hardened by the sun. They then fall an easy prey to ants, roaches and caribs. Where wild grape vines abound, cut them off at the ground in May or June, and let them hang ; in early spring saw them into short lengths and box them, and some rare beetles may be taken. Grubs under stones put away in the same ground in tin or glass, kept moist ; found under logs, use the same log debris, and add some sawdust. Finding two very large grubs with black heads under a log late in the fall, I

put them away in a tin can with log refuse and sawdust, and found a male ash beetle and a dead pupa in July. This beetle, *Xyloryctes satyrus* (Fab.), is taken under the roots of ash trees, and falls a victim to its curiosity, for if you begin to dig for them they will come out to see what is going on. I took fifteen from one tree in that way. April and May are generally devoted to searching in logs and dead trees for beetles, when many nymphs can be collected, which can generally be hatched out in a week or two. June and July are the great beating months. I have discarded the beating net for the inverted umbrella, and so will any one who has tried both, as beating the low limbs of trees around the edges of wood will yield tenfold the quantity and variety that bush and weed beating will. Woods protected from cattle and hogs, and full of vines and bushes, are best. Little is got by beating in the interior of woods. Insect life swarms along the edges. Examine the trunks of trees, and where flat stones abound scoop out cavities under them, where Cychrus and various caribs may be trapped; Cychrus are snail-feeders, and some bait traps with snails strung on strings through the shell. The beans of the honey locust yield *Spermophagus Robiniæ;* the fungus puff-ball, *Lycoperdina ferruginea;* all kinds of fungus swarm with beetles, also Staphilinidæ. Pselaphidæ are taken on the under side of stones, but mostly by sifting around decayed stumps on to a white cloth. Beat wild plum trees and haws when in blossom. Where beetles are found, by carefully replacing stones and bark more may be taken, as their scent remains. I was glad to take a single specimen of that rare and handsome longicorn, *Dryobius sexfasciatus*, in one season, but in the summer of 1878 I found five under one piece of bark of beech; so last season, when I found a small colony under bark on a dead maple, I tied the bark on again, and took seventeen more at different visits. Various beetles are also found on fruit and flowers. In closing, I would advise beginners to put small insects on paper slips or wedges, and not pin them with a No. 2 pin, as it cannot be inserted in cork without plyers, and is very liable to buckle. No. 3 enters cork readily, is not too large for paper slips, and about right for larger specimens. Further, do not use Spaulding's glue; it will turn your wedges brown, as it contains a discoloring acid. Make your own liquid glue—better at one-fourth the cost. Dissolve light colored glue or isinglass in the usual way; then while hot stir in alcohol, or a light colored, strained vinegar, till it is thin enough, and decant into a bottle. It can then be thinned with a little water, or by warming.

ANNUAL MEETING OF ENTOMOLOGICAL CLUB, A. A. A. S.

The annual meeting of the Entomological Club of the American Association for the Advancement of Science will be held at the Museum of the Boston Society of Natural History, corner of Berkeley and Boylston Sts., Boston, commencing at 2 p. m., Tuesday, Aug. 24, 1880. It is proposed to send to every member of the American Association, and to all others who may favor the undersigned with their address for that purpose, a circular announcing the special subjects which will be presented at this meeting of the Club; and therefore all entomologists who desire to read communications at that time are requested to notify one of the undersigned before August 1st. This will ensure a fuller discussion of the topics presented, and, it is hoped, a larger attendance.

There will be an informal social gathering of entomologists at the rooms of the Boston Society of Natural History, 24th Aug., 1880, from 10 a. m. to 1 p. m. During the meeting of the American Association a room will be constantly open for the exclusive use of the entomologists.

B. Pickman Mann, *Sec'y*, Cambridge, Mass.
Samuel H. Scudder, *Pres.*, Cambridge, Mass.

CORRESPONDENCE.

Dear Sir,—

Mr. W. H. Edwards, in his excellent article in the June No. of the Can. Ent., page 113, inadvertently gives my residence as Bloomington instead of Carbondale. It would be well to correct this, for 50 miles north of Bloomington the form of Satyrus should be *Olympus*, or approaching it, at least, and not as he gives it.

I like Mr. Coquillett's suggestion of having uniform terms for describing the larvæ of many moths, but would suggest a little change in his terms for the spaces. Would it not be better to call the space between the dorsal and subdorsal lines the *dorsal* space, the space between the subdorsal and stigmatal lines the *subdorsal* space, the space below the stigmatal line to the venter proper the *substigmatal* space? As the prefix *sub* means under or below, it is evident that one not having the text of his suggestion would look for the *subdorsal* space below that line, etc.

G. H. French, Carbondale, Ill.

The Canadian Entomologist.

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DESCRIPTION OF PREPARATORY STAGES OF ARGYNNIS CYBELE, Fabr.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG—Conoidal, truncated, broad at base, the sides moderately rounded; depressed at summit; marked by about eighteen prominent, vertical, slightly wavy ribs, half of which extend from base to summit and form around the latter a serrated rim; the remainder end irregularly at two thirds to three quarters distance from base; between each pair of ribs are equidistant transverse striæ. Broader at base than *Alcestis* or *Idalia*. Duration of this stage 12 to 17 days.

YOUNG LARVA—Length .07 inch; cylindrical, thickest at 5 and 6; color dull green, translucent; each segment from 3 to 12 marked by a transverse row of eight subtriangular tubercular dark spots, of which six lie on dorsum and upper part of side and one on each side below spiracles; the middle spot of the upper three is back of the line and near the posterior edge of the segment; from each spot spring one or two long curved hairs; on 13 is a dorsal row of four spots and a second of two spots near the extremity of the segment; on 2 is a chitinous oblong dorsal patch on which are minute tubercles, four in front row and one behind the first and fourth of that row, each with fine hairs; head a little broader than any segment, rounded, slightly bilobed, a little pilose; color black-brown.

After 1st Moult—Length .13 inch; cylindrical, stoutest in middle; color dull green mottled with brown, the latter taking the form of interrupted longitudinal stripes; spines disposed as in *Alcestis* and other members of the group; tapering, black, rising from black tubercles, except those of the lower lateral row, which have dull yellow tubercles; each spine ending in a short black bristle, and beset with several others; feet black, pro-legs greenish-brown; head sub-cordate, the vertices rounded, the front flattened and covered with many long black hairs; color shining black-brown. To next moult 8 to 12 days.

After 2nd Moult—Length .24 inch, color chocolate-brown, the lower lateral spines pale yellow at base and for one third up; both other rows have the bases more indistinctly yellow and then mostly on the outer sides, the inner being nearly or quite black; spines otherwise shining black, the bristles black; head subcordate, flattened frontally, the vertices rounded, and at top of each on front side a little conical black process; minute processes or tubercles are scattered over the face, the hairs springing from them; color shining black. To next moult 4, 6 and 9 days, according to the state of the weather.

After 3rd Moult—Length .4 inch; color dark velvety brown; the spines black; all of the lower laterals yellow at base and for about one third up; the upper laterals distinctly yellow at base on the anterior segments, the yellow gradually fading to the last segments; the dorsals also distinctly yellow on anterior segments, the last wholly black; the dorsal spines on 2 are directed forward, but are no longer than others; head as at next previous stage, black in front, but yellow behind; all yellow is reddish, or honey colored.

At this stage there was some variation in individuals in the color of the spines. One had all distinctly yellow at base except the dorsals on 2 and 12, which were black. To next moult 5 to 8 days.

After 4th Moult—Length .6 inch; color velvet-black; lower laterals wholly bright yolk-yellow; upper laterals same on anterior half, the remainder duller yellow; dorsals bright yellow on anterior half, but after 6 less so, and on 9 to 12 black; on 2 dorsals wholly black; in line with the dorsal spines on segments from 3 to 11 two gray dots; head as before.

Another larva had all three rows of spines largely reddish-yellow, fully half way up from base; the last two pairs of dorsals shading into brown. To 5th moult 4 to 8 days.

After 5th Moult—Length 1.1 and 1.2 inch. Reached maturity in six to eight days.

MATURE LARVA—Length 1.8 inch at rest, 2 inches in motion; greatest breadth at rest .35 inch; color velvety-black, under side chocolate-brown; between each pair of dorsal spines from 3 to 11 two gray dots transverse; the spines throughout slender, beset with short black bristles; the bases of all spines reddish-yellow, and for about two thirds up, the rest

shining black ; the spines of 2 wholly black, a little recurved, directed forward, but no longer than other dorsals ; the longest dorsals 1.4-100 inch ; feet and pro-legs black ; head small, .14 inch wide, and equally high, subcordate, the front flattened, finely tuberculated, the back much rounded, the vertices sub-conic, and each on its anterior side giving a small black conic process ; the face much covered with black hairs of irregular length ; color of front dull dark brown, of back reddish-yellow. Several larvæ were as described, others showed much less yellow on the spines ; the lower laterals always largely yellow, the upper laterals much less so, the dorsals a little yellow at base from 3 to 6, after that less and less, changing gradually to brown, and on 11 to 13 black. In from 2 to 3 days after maturity the larvæ suspended, and in about 24 hours pupated.

CHRYSALIS—Length 1.1 inch ; breadth at wing cases .4, of abdomen .36 inch ; cylindrical, a little compressed laterally ; head case prominent, nearly square at top, the vertices being but very slightly elevated, transversely rounded to the ridge at summit, the sides bevelled ; mesonotum moderately prominent, rounded, carinated ; followed by a deep rounded depression ; the wing cases with prominent conical processes at base, much elevated above surface of body, the outer edges flaring, the middle part depressed ; on the abdomen two rows of small tubercles corresponding to the dorsal spines of the larva, and which extend to the head case ; one row of minute tubercles on each side ; the whole surface finely corrugated ; color variable, being sometimes glossy dark brown, with a fine mottling of reddish-orange, not distinct, over wing cases and anterior parts ; or dark brown mottled with drab, this last prevailing on the wing cases ; or dark brown mottled with lighter brown, most distinctly light at margins of wing cases, where they pass down to surface ; or almost wholly dead-leaf brown, a little obscure on wing cases ; the anterior abdominal tubercles usually black in front, yellow behind, the posterior tubercles wholly black. Duration of this stage 16 to 20 days.

In Can. Ent., vi., p. 121, 1874, I gave a general account of breeding the larvæ of *Cybele, Aphrodite* and *Diana*. Since that date I have bred *Cybele* as well as other species of this group, but before 1880 I always lost the larger part of the larvæ during the winter, or they died off at their successive stages, or in chrysalis. I attempted to keep the larvæ after hatching, which occurs in September or October, in a cool room free from

dampness, they being placed on stems of violets growing in pots. But the alternation of warm with cold weather during the fall and winter was unsuitable for the larvae, the leaves damped off, or the plants died, and there was a constant loss. After the survivors were brought into a warm room later in the winter they were not healthy, but lingered along, every stage being protracted, many perishing even up to chrysalis and imago, or the butterflies perhaps came out crippled. In 1873, starting with more than 300 young larvae of *Diana*, I obtained but a single butterfly. From as many eggs of *Cybele* I got three butterflies, and of *Aphrodite* one chrysalis only, which died before imago.

Encouraged by the results obtained by freezing the larvae of Satyrus *Alope* in winter of 1878–79, I determined to try the effect of cold on the larvae of *Cybele*, and availing myself of the kindly offered aid of Prof. C. H. Fernald, I sent a considerable number of recently hatched larvae to him at Orono, Maine, to be placed in ice-house. They were in small paper pill boxes, the unglazed sides of which afforded foothold. I had found that the eggs or larvae of *Alope* escaped mould in such boxes, while others on cloth were destroyed. These little boxes were placed in a flat tin box, which was deposited in the sawdust beneath the ice, "frozen sawdust," as Prof. Fernald wrote. Five months later, on 5th March, 1880, I received the boxes by mail. The larvae were found to be nearly all alive—not more than one or two dead—and when first seen several showed some movement, though only three days from ice. Others were lethargic some hours longer, but by the 6th nearly all had left the boxes and betaken themselves to the plants of violet amid which I had laid them. They crawled at and down the stems, and disposed themselves in the concave sides just as they do in the fall when about to go into lethargy. On 10th March one of the larvae was found to have passed 1st moult, several days in advance of any other, and it continued in advance to maturity, passing 2nd moult 18th, 3rd 27th, 4th 4th April, 5th 12th April, suspended 23rd, pupated 24th, and gave imago, *Cybele* ♀, 14th May. The whole period from ice to butterfly was 73 days. The other larvae passed 1st moult 19th March, 2nd 29th March to 2nd April, 3rd 4th to 6th April, 4th 11th to 12th, 5th 16th to 19th April, and the butterflies issued 12th to 27th May.

What loss of larvae there was occurred before 1st moult, partly by escape, as it seemed, but partly, as I thought, from having been introduced to a warm room too abruptly. But after the moult I lost none. I

preserved some examples at every stage in alcohol, and so reduced the number, but there was no death among the larvae which were allowed to proceed, and I obtained at last seven perfect butterflies, 1 ♂, 6 ♀. They were also of very large size, equal to any taken in the field. It is evident, therefore, that freezing did not injure the larvae, but on the contrary, invigorated them, enabling them to pass their successive stages rapidly.

Comparing the length of these stages with larvae bred in 1873–4.

Iced larvae, 1880.

Time from removal to	1st moult	8 to 18	days.
"	1st to 2nd "	8 to 12	"
"	2nd to 3rd "	4 to 9	"
"	3rd to 4th "	5 to 8	"
"	4th to 5th "	4 to 8	"
"	5th to chrysalis	9 to 12	"
"	chrysalis to butterfly	16 to 20	"
Total period		54 to 87	"

Larvae kept in cool room, as related.

Time from removal to	1st moult	44	days	and upwards.
" "	1st to 2nd "	17	"	"
" "	2nd to 3rd "	11	"	"
" "	3rd to 4th "	12	"	"
" "	4th to 5th "	14	"	"
" to chrysalis		12	"	
" in "		24	"	
From removal from cool room to imago.		134	"	and upwards.

From 1st moult to imago, 90 days.

I have no doubt that by freezing any species of larvae which hybernate, they may successfully be carried to imago—such as Argynnis, Melitaea, Colias, Apatura, Satyrids, Hesperians, etc. Probably it would be better not to remove them from the ice until spring has fairly set in, instead of rousing them prematurely, as I did in case of *Cybele*.

Comparing the coloration of the butterflies from the iced larvae with examples taken this season in the field, I see no difference.

MONTREAL BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

SEVENTH ANNUAL REPORT OF THE COUNCIL.

At the close of the seventh year of the Society's existence your Council beg to present their Annual Report. The retrospect of the year in Entomological matters is a pleasant one. Nine meetings have been held, the attendance at which has been good, and the intercourse of the members has been both agreeable and instructive. Besides the eight papers whose titles are hereafter given, many valuable observations on insect life have been recorded in our minutes, which will be of great assistance to us in the future.

Your Council would also notice that during the summer of last year several enjoyable collecting excursions were participated in by the members, resulting in the discovery of several species of insects hitherto unknown in this locality. On the whole, it is with great pleasure that your Council report the Society to be satisfactorily progressing in the study of our science.

The papers read during the year are as follows:

1. "A Description of the Male *Alypia MacCullochii* Kirby," by William Couper.
2. "Notes on a Species of *Cossus* taken at Montreal," by F. B. Caulfield.
3. "The Milk Plant, its Insect Parasites, red and black in color," by William Couper.
4. "How to Preserve Specimens of Insects," by G. J. Bowles.
5. "On Luminous Insects," by Geo. H. Bowles.
6. "Montreal Hymenoptera," by Wm. Couper.
7. "Notes on Rearing Lepidoptera," by H. H. Lyman.
8. "Some of the Insects that Frequent the Orchard and Garden," Rev. F. W. Fyles. (Selected) by G. J. Bowles.

The study of the Hymenoptera of Montreal has been taken up by Mr. Couper, whose capacity and experience render it certain that the task will be well performed, and result in a great increase in our knowledge of that interesting order. Your Council would recommend the members to follow his example, and during the coming season give special attention

to other divisions which hitherto we have almost neglected, namely, the Diptera, Orthoptera, Hemiptera and Neuroptera.

The following works have been added to the Society's Library during the year:

"Monograph of the Diptera of North America." Part 3, 4 plates. By H. Loew.

"New Species of N. A. Coleoptera." Part 1. By J. L. LeConte.

"The Coleoptera of Kansas and Eastern New Mexico," 2 plates. J. L. LeConte.

"Synopsis of the Melolonthidæ of the United States" J. L. LeConte.

"Catalogue of Coleoptera adjacent to the Boundary Line between the United States and Mexico," 1 plate. J. L. LeConte.

"Revision of the Buprestidae of the United States," 1 plate. J. L. LeConte.

"Report of the Entomological Society of Ontario for 1879."

"Report of the Fruit Growers' Association of Montreal, 1879."

The following were presented by the Royal University of Christiania:

"On the Mollusca of the Arctic Regions." One large volume and two pamphlets.

"A List of Norwegian Lepidoptera taken in 1876."

The Secretary and Treasurer's cash statement is submitted herewith, and shows the finances to be in a satisfactory condition.

In conclusion, your Council would express the hope that the members will not relax their efforts during the present season, and that the result of the summer's campaign will be even more favorable than that of last year.

The whole respectfully submitted.

GEO. JNO. BOWLES, President.
GEO. H. BOWLES, Secretary.

Montreal, 17th May, 1880.

CORRECTION.—On page 113—last Satyrus paper—is an error. Three lines from bottom, let the two lines beginning "Indeed the only," etc., be stricken out. It turns out that North Bend is in the extreme north-west of Indiana, and not on the Ohio, as I had supposed; and the statement I make is inapplicable in the connection.—W. H. EDWARDS, Coalburgh, W. Va.

ENTOMOLOGY FOR BEGINNERS.

BY R. VASHON ROGERS, JR., KINGSTON, ONT.

CLYTUS.

Among the Coleopterous hosts there is a family called Long-horns, or Capricorns, in vulgar parlance ; or Cerambycidæ, when we are talking learnedly. They derive these names from the fact that they possess very long antennæ (sometimes longer than their bodies), which are generally re-curved like the horns of a wild goat (the Latin *Caper*). They form a very large family ; already 4,000 of them are known and recognized by the scientific world. They comprise some of the largest, most showy, as well as most destructive, of the Beetles ; one of African origin—*Prionus Hayesii* by name—is five inches long and one broad, with antennæ of seven inches and legs of four. The Long-horns are world-wide, and their abundance is in proportion to the richness of vegetation of different countries, so that South America, India, Ceylon and the Moluccas contain a great number of the most beautiful and the largest Capricorns.

They have earned the name of Borers because they are, in fact, "animated gimlets," and spend their lives while in the larval state in perforating and feeding upon trees ; some live and carry on their operations in the trunks, others in the branches ; some devour the wood, others the pith ; some are found only in shrubs, some in the stems of herbaceous plants, others confine their attentions to the roots. Some are to be found only on one species of plants, others have a wider range. Some bore straight holes, others branch off at divers angles, others make tracks as various as those of an engraver, while some are regular screws. The Germans, lovers of music, as they are, call these beetles "Fiddlers," because they give forth, especially when annoyed or taken in the hand, a squeaking or rasping noise produced by rubbing the joints of the thorax and abdomen together. Some of the family are not only musical-boxes, but scent-bottles as well, and emit a fragrant odor not unlike that of otto of roses.

The members of this family, as a rule, are very handsome, and readily attract notice by their elegant forms and resplendent attire, that is, when of full age ; when young—in the creeping age—they are ugly in the extreme. Harris tells us that the various members of the family resemble

each other in the following respects : The antennæ are long and tapering. The body is oblong, approaching to a cylindrical form, a little flattened above, and tapering somewhat behind. The head is short and armed with powerful jaws. The thorax is either square, barrel-shaped, or narrowed before, and is not so wide behind as the wing-covers. The legs are long ; the thighs thickened in the middle ; the feet four-jointed, not formed for rapid motion, but for standing securely, being broad and cushioned beneath, with the third joint deeply notched. Most of these beetles remain upon the trees and shrubs during the day time, but fly abroad at night. Some of them, however, fly by day, and may be found on flowers, feeding on the pollen and blossoms.

Fig. 21.

The pride of our Canadian forests, the Maple tree, suffers much from the attacks of *Clytus speciosus* (fig. 21), the largest of our native members of the family. This beautiful beetle is easily recognized ; it is about an inch in length, and the third of one in breadth. The head is yellow, with antennæ and eyes of reddish black. In shape the body is somewhat cylindrical, a little flattened above and tapering behind. The thorax is black with two yellow transverse spots on each side. The wing covers for more than half their length are black, for the rest they are yellow ; they are gaily ornamented with bands and spots arranged as follows : A yellow spot on each shoulder, a broad yellow curved band or arch, of which the yellow scutel forms the keystone, on the base of the wing covers ; behind this a zig-zag yellow band forming the letter W ; across the middle another yellow band arching backwards, and on the yellow tip a curved band and a spot of a black color ; the legs are yellow.

The under side of the abdomen is reddish yellow, variegated with brown. The female has the advantage of her mate in size, but her antennæ are somewhat shorter. She possesses a pointed tube at the end of the abdomen, through which the eggs are passed from her body into the cracks and crevices of the bark. The tube can be contracted or extended at the will of the fair owner and to suit the emergency of the case.

The parent lays her eggs on the bark of the Maple in July or August. As soon as the grubs are hatched they burrow into the bark, and there find protection during the cold of winter. When the warm days again

return the larvæ begin again their labors, penetrating deeper and deeper into the heart of the tree, sometimes tunnelling as much as three inches into the solid wood ; they make long and winding galleries up and down the trunks. A carpenter is known by his chips, so their presence is readily detected by the little heaps of sawdust that they throw out of their work-shops. If in time a stiff wire is inserted into their holes they can be easily put an end to by impaling. They are long, whitish, fleshy, deeply marked by transverse cuts ; their legs, although sixteen in number, are merely rudimentary promises of legs, and for ornament, not use ; they are of no avail for the purpose of locomotion. Not by means of their eight pairs of legs, but by alternately contracting and extending the segments of their bodies, do these worm-like creatures force their way along, and in order to assist their progress each segment is furnished with fleshy tubercles capable of protrusion, and which being pressed against the sides of their retreats, enable them to thrust forward by degrees the other segments (Ent. Rep., 1872, p. 36).

The head is the box of tools with which they saw and cut their way through the wood ; their work "is done slowly but effectively, and their gnawing teeth, though slow in action, are as resistless as the mordant tooth of time."

About midsummer these busy little carpenters who have never seen the light of day, unless by accident, strike—not for higher wages—but for a higher stage of existence ; they labor no more, but in the innermost recesses of their living homes fold themselves up snugly for their pupa sleep. At first the nymph is soft and whitish, but gradually it hardens and darkens till at last it lies enwrapped in a filmy veil, beneath which all the external parts of the future beetle are visible. The wings and the legs are folded calmly on the breast, while the long antennæ are turned back against the sides of the body and then tucked up between the legs. When at length it has become matured, it breaks its slumbers, forces its way through the bark, and comes out of its dark and narrow retreat to see the world and enjoy for the first time the glorious light of day and the pleasures of legs and wings, and love and passion, and to propagate its race.

Clytus pictus Drury, or the Painted Clytus, is another of our common species. Its form is very similar to that of *C. speciosus*, and it varies from six-tenths to three-fourths of an inch in length. Harris thus describes it : It is velvet black, and ornamented with transverse yellow bands, of which

there are three on the head, four on the thorax, and six on the wing-covers, the tips of which are also edged with yellow. The first and second bands on each wing-cover are nearly straight; the third band forms a V, or united with the opposite one, a W, as in *speciosus;* the fourth is also angled, and runs upwards on the inner margin of the wing-cover towards the scutel; the fifth is broken or interrupted by a longitudinal elevated line, and the sixth is arched and consists of three little spots. The antennæ are dark brown, and the legs are rust-red.

Clytus Robiniæ Forster.—According to Walsh the male of this species differs from *C. pictus* in having much longer and stouter antennæ, and in having its body tapered behind to a blunt point, while the female is not distinguishable at all. This insect does great injury to the Locust and Acacia trees, and appears in the perfect state in September. Harris confounds this with *Clytus pictus;* in fact, it was long considered by Entomologists to be identical with it. It has sometimes been known as *Clytus flexuous* Fab.

During comparatively late years *Robiniæ* has been extending its sphere of operations. For a long time it was known only in New York. Some thirty years ago it appeared in Chicago, and in 1863 it was seen two hundred miles further west. In 1855 it was first observed in Montreal; in 1862 it was very destructive to the Locust trees around Toronto; in 1873 Mr. E. B. Reed saw it in enormous numbers in London, Ont. Now it seems to be quite at home in all parts of Ontario. Harris, speaking evidently of this, though under the name of *C. pictus*, says: "In the month of September these beetles gather on the Locust trees, where they may be seen glittering in the sunbeams with their gorgeous livery of black velvet and gold, coursing up and down the trunks in pursuit of their mates, or to drive away their rivals, and stopping every now and then to salute those they meet with a rapid bowing of the shoulders, accompanied by a creaking sound, indicative of recognition or defiance. Having paired, the female, attended by her partner, creeps over the bark, searching the crevices with her antennæ, and dropping therein her snow-white eggs, in clusters of seven or eight together, till her whole stock is safely stored. The eggs are soon hatched, and the grubs immediately burrow into the bark, devouring the soft inner substance that suffices for their nourishment until the approach of winter, during which they remain at rest in a torpid state. In the spring they bore through the soft wood, more or less deeply into the trunk, the general course of their winding and irregular passages

being in an upward direction from their place of entrance. For a time they cast their chips out of their holes as fast as they are made, but after a while the passage becomes clogged and the burrow more or less filled with the coarse and fibrous fragments or wood, to get rid of which the grubs are often obliged to open new holes through the bark. The seat of their operations is known by the oozing of the sap and the dropping of the saw dust from the holes. The bark around the part attacked begins to swell, and in a few years the trunks and limbs will become disfigured and weakened by large porous tumors, caused by the efforts of the trees to repair the injuries they have suffered. . . . The grubs attain their full size by the 20th of July, soon become pupæ, and are changed into beetles and leave the trees early in September. Thus the existence of the species is limited to one year."

Space will not permit me to speak of the other members of this interesting and beautiful family—*nobilis*, *luscus*, *campestris*, *undulatus*, *longipes*, &c., each one of which is well worthy of a full description and biography.

DESCRIPTIONS OF NOCTUIDÆ.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

Before describing Noctuidæ the structure of the front or clypeus, between the compound eyes, must be examined. In a few genera it has a projection, or again a cup-like depression. The presence of ocelli, behind the antennæ, must be ascertained, and the compound eyes must be viewed under the microscope to see if the surface is naked or hairy. The tibiæ must be examined to see if they are spinose or unarmed, and the armature of the front pair, which is subject to considerable variation, must be studied carefully. After that the shape of the collar, the tuftings of the body, the neuration of the wings, the peculiarities of the antennæ and palpi, and the form of the genitalia should pass under inspection. Structural points given in descriptions will make it easier to place the species, and since our American genera are not yet in many cases fully understood, such additions to a description of the ornamentation are quite necessary.

Agrotis hilaris, n. s.

♂. Concolorous silky blackish gray with a sprinkling of paler scales. Antennae rather lengthily bipectinate. Head, collar and thorax concolorous, collar a little darker tipped; palpi darker at the sides. Only the two median lines visible; these are even, pale, the inner line oblique, the outer somewhat bent, nearly straight, not inflected. A black spot on the cell against the inner line, and a second, quadrate, larger, at the middle. These black spots follow and precede the orbicular, which, with the reniform, is concolorous with the wing and difficult to make out. The orbicular is v-shaped, open above; the reniform small, upright, medially constricted; both spots indistinctly pale-ringed. A small black spot on the line indicates the claviform. Median lines slightly marked with black on costa. Fringes concolorous. Hind wings blackish, paler at base; fringes pale, interlined. Beneath both wings blackish, with pale irrorations; a common extra mesial shade line. *Expanse* 34 mil. Texas, Mr. Boll.

Resembles in color and markings *collaris*, but the collar is concolorous, antennæ pectinate, the species is stouter. By the pectinate antennae allied to *badinodis;* the primaries are narrower, the color is different, the lines are pale and the inner more oblique, the collar is not distinctly dark above. The species has a slightly hoary aspect from the admixture of pale scales.

Agrotis stellaris, n. s.

♀. Varies in color from blackish to reddish purple nearly as bright as *phyllophora*. Collar yellowish white, discolorous with head and thorax. Palpi with pale third article. Reniform kidney-shaped, yellowish white, discolorous. Orbicular rounded, somewhat irregular and slightly oblique, nearly concolorous with the wing, a little shaded with yellowish; both spots annulate with dark. Lines single, blackish; half-line indicated; t. a. line waved; t. p. line lunulate, followed by a pale shade against which the darker veins and faint cloudy pointlets of the line contrast; s. t. line inaugurated by a diffuse shade on costa, below which the line is exserted and followed by pale points. Hind wings pale, soiled or fuscous-shaded, with terminal line. Beneath with discal marks and common line. *Expanse* 34 mil. *Hab.* Wash. T. (darker specimens, Mr. E. L. Graef); Nevada (reddish specimens, Mr. Neumogen).

Agrotis citricolor, n. s.

♂ ♀. All the tibiae spinose ; eyes naked ; ♂ antennae brush-like. Thorax and fore wings light lemon yellow ; a shaded blackish mark in the place of the reniform. Terminal space and fringes brownish. Lines obsolete. Hind wings and abdomen white. *Exp.* 34 mil. *Hab.* Colorado.

This species is so simply marked and colored that the description is necessarily brief, while the insect is none the less readily recognizable.

Agrotis innotabilis Grote, Proc. Ac. N. S. Phil,, 202, 1874.

This species may be known by the yellow brown reniform contrasting with the concolorous blackish orbicular. The collar is black above, gray below. Specimens from Washington Territory differ from my type from California by the median space being shaded with brown, the claviform outlined, and several fine black lines cross from the two median lines over the median space inferiorly. The species is allied to *bicarnea*. The orbicular is more or less evidently quadrate and oblique.

Polia aedon, n. s.

Eyes naked. Tibiae unarmed. Whitish gray. All the lines well written, single, black, acutely dentate. Orbicular elongate on the cell, complete, rather small. Claviform long ; reniform incompletely limited exteriorly, rather wide, moderate. Median shade nearly continuous, dentate, shading into ochrey, and the reniform is slightly ochrey. Subterminal line irregular, strongly dentate, the teeth strongly shaded with black. T. p. line continuous, dentate, rather fainter than the other lines. A dotted terminal line ; fringes dotted. The whole insect is rather dark gray ; the thoracic disc with a yellowish tuft behind the collar ; faint lines on the tegulae ; a black line across the face ; palpi entirely gray. Hind wings pale wlth a mesial line accented on the veins. Beneath pale, the line appears dotted and there are discal marks on both wings. *Exp.* 40 mil. *Hab.* Nevada, Mr. Neumoegen ; I have seen a second specimen in Mr. Graef's collection.

Tarache sutrix, n. s.

Allied to *aprica* and between *aprica* and *tenuicula*. Yellowish or ochrey white. Inner line pale ochrey. A black point for the orbicular. Median shade rather thick, black, below and within the dot or the faint ringlet which represents the reniform ; above marked in pale ochrey to

costa. Outer line indistinct, ochrey, irregular. S. t. space shaded with plumbeous. S. t. line denticulate, followed by the pale ground color, marked with brown on costa. Terminal space irregularly shaded with plumbeous. Terminal line consisting of a series of minute black dots preceded by white points. Fringes brown or plumbeous, interrupted by a pale patch below the middle and touched with pale at apices. Hind wings pale smoky, with whitish faintly interlined fringes. Thorax ochrey white. Head ochrey white ; palpi black tipped. Beneath hind wings without markings ; fore wings shaded with blackish, leaving costa pale. *Expanse* 22 mil. *Hab.* Colorado ; two specimens nearly alike.

I have recently examined the species of the following naked-eyed genera in my collection, and arranged them as follows :

ORTHOSIA *Ochs.*

purpurea *Grote.* California.
crispa *Harvey.* California.
bicolorago *Guen.* Can. East ; Middle and West. States.
var. *ferrugineoides* Guen.
var. *bicolorago* Guen.
spurcata Walk.
ralla *G. & R.* Middle States.
helva *Grote.* Eastern and Middle States.
euroa *G. & R.* Can. ; Western and Middle States.
aurantiago *Guen.* Middle and West. States.
illiterata Grote.
differta Morr.
illinoisensis French.
disticha *Grote.* South. and Western States.
Caradrina disticha Morr. ?
posticata *Harvey.* Texas ; Calif..
lutosa *Andrews.* Eastern and Middle States.
Conradi *Grote.* Western States.

GLAEA Hubn. Steph.

§ *Homoglaea* Morr.

bircina *Morr.* Can. ; Illinois.
carnosa *Grote.* N. Y. ; Mass. ; R. I.

§ *Orrhodia* Hubn.

viatica *Grote.* Middle and So. States.

inulta *Grote.* Western and Middle States.
olivata *Harvey.* California.
anchocelioides *Guen.* Illinois ; Texas.
signata French.

§ *Epiglaea* Grote.

pastillicans *Morr.* N. Y. ; So. N. England.
tremula *Harvey.* Texas.
sericea *Morr.* N. Y. ; So. N. England.
venustula Grote.
apiata *Grote.* N. Y. ; So. N. England.
decliva *Grote.* Ill. ; N. Y. ; N. England.
var. *deleta* Grote.

Jodia Hubn.

rufago *Hubn.* Tex. ; Kansas.

Cirroedia Guen.

pampina *Guen.* N. E. Can. ; Calif. ; N. Y. ; West. States.

Scoliopteryx Germ.

libatrix *Linn.* H. Bay Terr. to Va. Also European.

Xanthia Hubn.

silago *Esper.* N. Y. Also European.

Scopelosoma Curtis.

Pettiti *Grote.* Can. ; Illinois.
Graefiana *Grote.* Can. ; N. Y. ; N. J.
ceromatica *Grote.* Can. ; N. Y. ; N. J.
devia *Grote.* Ill. ; N. Y. ; Mass.
Morrisoni *Grote.* Ill. ; Mass.
sidus *Guen.* Middle and Eastern States ; Can.
var. *vinulenta* Gr.
var. *Walkeri* Gr.
tristigmata *Grote,* N. Y. ; Illinois.

Litholomia Grote.

napaea *Morr.* Can. ; Eastern States.

Lithophane Hubn.

disposita *Morr.* Middle and Eastern States.
hemina *Grote.* N. Y.

petulca *Grote.* Can. ; Middle States.
ferrealis *Grote.* Can. ; Middle States.
signosa *Walk.* N. Y. ; Middle States.
Bethunei *G. & R.* Can. ; Middle and Eastern States.
oriunda *Grote.* Canada ; Wisc.
semiusta *Grote.* Illinois ; Canada.
carbonaria *Harvey.* Calif. ; (coll. Hy. Edw.)
oregonensis *Harvey.* Oregon (coll. Hy. Edw.)
fagina *Morr.* Eastern and Middle States.
Georgii *Grote.* Can. ; N. Y.
antennata *Walk.* Can. ; Eastern, Middle and Western States.
cinerea Riley.
laticinerea *Grote.* Can. ; Eastern and Middle States.
cinerosa *Grote.* N. Y. ; praec. var. ?
unimoda *Lintner.* N. Y. ; praec. var. ?
tepida *Grote.* Can. ; N. Y. ; Mass.
Baileyi *Grote.* Can. ; N. Y. ; Mass.
viridipallens *Grote.* Mass.
querquera *Grote.* Mo. ; N. Y. ; Mass.
pexata *Grote.* Can. ; Eastern and Middle States.
lepida *Lintner.* Maine ; N. Y.
Thaxteri *Grote.* Eastern and Middle States.
capax *G. & R.* Eastern and Middle States.

CALOCAMPA Steph.

nupera *Lintner.* Eastern and Middle States.
cineritia *Grote.* Eastern and Middle States ; Oregon.
curvimacula *Morr.* Eastern and Middle States.

LITHOMIA Hubn.

germana *Morr.* Eastern and Middle States.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting of the above Society will be held in the City Hall, Hamilton, on the evening of Tuesday, the 28th of September, at 7:30 p. m. We trust that as many of our members as can possibly be present, will make it their business to attend.

A NEW SILK-SPINNING CHALCID.

BY L. O. HOWARD, WASHINGTON.

During the summer of 1879, while working with Professor Comstock upon the natural enemies of the cotton worm, I came across the following passage in his field notes of the previous year :—

"August 27.—I found yesterday a cotton worm about five-eighths of an inch in length, which, though yet alive, was being destroyed by three green larvæ which were upon it. I found the specimens about 10 a. m. Last evening I observed that the cotton worm was nearly eaten. The parasites had very short bodies, which, when they moved, were pointed at one end. I had intended to describe the specimens, but I find that they have spun cocoons about their bodies.

"August 28.—I found crawling over the ground a small cotton worm, infested by five parasites, evidently of the same species as those mentioned in my note of August 27.

"August 29.—The small green parasites which I found yesterday, destroyed the cotton worm, and, excepting two specimens which I put in alcohol, began to spin cocoons during the night."

Upon looking the specimens up, I found that two adults had issued. Owing to a lack of time the insect was not worked up for the Cotton Insect Report, and only recently have I had time to study it.

Instances in which Chalcid larvæ have been observed to spin perfect cocoons are rare. One of the most marked instances upon record is the case of the European *Euplectrus albiventris*, which was first shown to have this habit by Nees at Esenbeck (Hym. Ochn. Aff. Monogr. II. h 136). Westwood also states (Intr. II 163) that, in drawings of Chalcididæ by Fonscolombe, the larva of this same species was represented as feeding *externally* upon a large caterpillar, and that in his description he, too, noted its cocoon spinning habit.

Now it is quite interesting to find that our cotton worm parasite is also a *Euplectrus*, some thirty years having elapsed before M. de Fonscolombe's observations have been verified. As explanatory of the fact that M. de Fonscolombe and Professor Comstock both observed these larvæ feeding *externally* upon their hosts, it may be urged that this external feeding was simply temporary and preparatory to spinning the cocoon, the larvæ having only recently emerged; yet, from M. de Fonscolombe's wording, "sic

cum eruca crescit, eam paulatim consumens,"—implying continued observation, and also from the fact that Prof. Comstock found his larvæ upon *half-grown* cotton worms, the opposite view can be readily held. The species, I think, may appropriately be dedicated to Prof. Comstock.

EUPLECTRUS COMSTOCKII, n. sp.

Male.—Length of body, 1.8 mm.; expanse of wing, 4 mm.; antennal scape, slender; joint 2, small; remaining five joints larger, ovate, subequal. Head smooth; scutum with many shallow, transversely elongate punctuations; scutellum and remainder of thorax smooth; abdomen smooth and shining. Scutum, with a very delicate longitudinal carina, extending back into the scuto-scutellar furrow, and forward to the prothorax. Middle tibial spur delicate, but as long as the first and second tarsal joints together. Color, black; upper surface of abdomen with an ochreous patch of varying size; antennæ and all legs ochreous; eyes dark red; wing veins fuscous.*

Described from 2 ♂ specimens.

OTTAWA FIELD NATURALISTS' CLUB.

TRANSACTIONS NO. 1.

The records of the first year's efforts of this active and enterprising organization fill a goodly octavo pamphlet of sixty-two pages, which is adorned with two excellent plates. From the annual report of the Council, contained therein, we learn that the Club has a membership of over eighty, and that five excursions, for the purpose of collecting objects of natural history, have taken place during the year, with an average attendance of thirty. During the winter months a successful series of soirees were held, seven in number, at each of which interesting papers were read by members, and the specimens collected on the excursions exhibited. Many of the papers are published in the transactions; also a list of plants collected in the Ottawa district by the energetic Vice-president, Mr. Jas. Fletcher.

In the successful maintenance of this Natural History Club, Ottawa has set a noble example, which we trust will be speedily followed by similar organizations in other cities of our Province.

* In the figure of this insect, p. 196 of the report on Cotton Insect, the tarsi should be 4-jointed instead of 5, and the parts of the mesothorax should be entirely revised.

APPOINTMENT OF STATE ENTOMOLOGIST FOR NEW YORK.

We learn with much pleasure that our esteemed friend and valued contributor, Mr. J. A. Lintner, of Albany, N. Y., has received the appointment of State Entomologist. A better qualified man for the position could not, we believe, be found. Mr. Lintner has for the past thirty years devoted a large portion of his time to the study of Entomology, and paid especial attention to that practical department of the science which treats of insects injurious to agriculture. The enormous loss occasioned yearly by destructive insects, is now well known, and every means discovered to prevent or lessen these ravages, results in a large yearly gain to the cultivators of the soil. The special business of the State Entomologist will be to endeavor to ascertain how this desirable end can best be accomplished. We anticipate good results from this judicious appointment.

CORRESPONDENCE.

CAPTURE OF A BI-FORMED LYCÆNA.

DEAR SIR,—

On the 6th of June, 1880, I took a bi-formed example of Lycæna *neglecta*, one side of which had the coloration of the male, the other of the female. It was a male, as appeared on exposing the genital organs.

W. H. EDWARDS.

Coalburgh, Ma., June 18, 1880.

DEAR SIR,—

Referring to some correspondence in the ENTOMOLOGIST for 1878, page 60, I beg to inform you that during the first week in July I found *Melitæa phæton* in considerable quantities in a small clearing in Dow's swamp, about one mile south of this city. The swamp is densely wooded with Tamarack and a thick undergrowth of Myrica gale, Salices, Alnus incana, &c., besides many herbaceous plants, and among them (but not at all plentiful) Chelone glabra. Upon enquiry, I find that this clearing was the exact locality where the late Mr. B. Billings found this Butterfly in 1870.

J. FLETCHER, Ottawa.

The Canadian Entomologist.

VOL. XII. LONDON, ONT., SEPTEMBER, 1880. No. 9

ANNUAL MEETING OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The annual gathering of the Entomologists of North America, in connection with the meeting of the A. A. A. S., took place this year at Boston, Mass., and was the most important that has ever been held, both as regards the largeness of the attendance, the number and value of the papers read, and also as regards the general interest taken in the proceedings. So highly indeed was it esteemed that the Standing Committee of the Association formed the Club into a Sub-section of Section B., (Zoology, Botany, &c.), and will publish its proceedings in the annual volume of transactions.

The first session was held in the lecture-room of the Museum of the Boston Society of Natural History at 2 o'clock p. m., on Tuesday, August 24th, 1880; the President, S. H. Scudder, of Cambridge, Mass., in the chair. There were over sixty persons present during this first meeting, and at least one hundred in all must have attended the various sessions of the Club. Amongst those present were the following Entomologists of note:—Dr. J. A. Lintner, Dr. John L. LeConte, Dr. John G. Morris, Prof. C. V. Riley, Dr. H. A. Hagen, A. R. Grote, Prof. Packard, S. S. Haldeman, B. P. Mann, Prof. C. H. Fernald, Prof. A. J. Cook, Dr. C. S. Minot, Rev. H. C. McCook, E. P. Austin, E. L. Graef, H. F. Bassett, J. D. Putnam, Dr. E. L. Mark, E. Burgess, Dr. Martin, J. G. Henderson, Prof. Morse, Dr. Hoy, O. S. Westcott and J. H. Emerton. The Entomological Society of Ontario was represented by the Rev. C. J. S. Bethune, of Port Hope, and H. H. Lyman, of Montreal.

After the meeting had been called to order, the President, Mr. Scudder, delivered the following address on "Problems in Entomology":—

ANNUAL ADDRESS OF THE PRESIDENT.

It is the good fortune of your President on this occasion to welcome you to his native heath, where our favorite science has been longer, more uninterruptedly, and, perhaps, more zealously cultivated, than anywhere

else in the New World. Here, in the last century, Peck studied the Cankerworm and the Slug-worm of the Cherry, and, in late years, *Rhynchaenus*, *Stenocorus*, and *Cossus*—all highly destructive insects. Here lived Harris, who cultivated entomology in its broadest sense, and whose classic treatise was the first important Government publication on injurious insects. Here, to-day, we have two associations for our work, consisting, it will be confessed, of nearly the same individuals, and not many of them, but meeting frequently—one in Boston, the other in Cambridge. Harvard acknowledges the claims of our study in supporting not only an instructor in entomology at its Agricultural School, but a full professor of the same in the University at large.

Harris attributed to Peck his special interest in entomology, and his first paper, that on the Salt-marsh Caterpillar, appeared in the *Massachusetts Agricultural Repository* only four years after Peck's last, in the same magazine, on Cherry and Oak Insects. How many of us have drawn our first inspirations from Harris? Yet probably not one of our local entomologists ever saw him. The general direction of Harris's studies doubtless arose from the predilections of his instructor; and the unprecedented growth of economic entomology in this country, where it flourishes as nowhere else, must be credited primarily to the influence of Harris's work. With every temptation which the wealth of new material about him could give, or which a very extensive correspondence with naturalists devoting themselves almost exclusively to systematic work, like Say, would naturally foster, he wisely followed the bent given his studies by his early training under Peck, and left a better example and a more generous and enduring influence.

In our own day, the spreading territory of the United States, the penetration of its wilds, and the intersection of its whole area by routes of travel, the wider distribution and greatly increased numbers of local entomologists, as well as the demand for our natural products abroad, have set also before *us* the same temptation to study only new forms and to cultivate descriptive work, to the neglect of the choicer, broader fields of an ever-opening science. It is this danger to which I venture briefly to call your attention to-day, not by way of disparaging the former, but rather in the hope that some of our younger members, who have not yet fallen into the ruts of work, may be induced to turn their attention to some of the more fruitful fields of diligent research.

We should not apply the term descriptive work merely to the study of

the external features of insects. The great bulk of what passes for comparative anatomy, physiology and embryology, is purely descriptive, and is only to be awarded a higher grade in a scale of studies than that which deals with the external properties, when it requires a better training of the hand and eye to carry it out, and greater patience of investigation. We pass at once to a higher grade of research when we deal with comparisons or processes (which, of course, involve comparisons). All good descriptive work, indeed, is also comparative; but at the best it is so only in the narrowest sense, for only intimately allied forms are compared. In descriptive work we deal with simple facts; in comparative work we deal with their collocation. "Facts," said Agassiz, one day, "Facts are stupid things, until brought in connection with some general law."

It is to this higher plane that concerns itself with general laws that I would urge the young student to bend his steps. The way is hard; but in this lies one of its charms, for labor is its own reward. It is by patient plodding that the goal is reached; every step costs and counts; the ever-broadening field of knowledge exhilarates the spirit and intensifies the ambition; there is no such thing as satiety—study of this sort never palls.

It is hardly necessary to point out that so-called systematic work never reaches this higher grade unless it is monographic; unless it deals in a broad way with the relationship and general affinities of insects. It is not my purpose to call attention here to the needs of science in this department, as they are too patent to escape observation; but if one desires a model upon which to construct such work, one need not look further than the Revision of the Rhynchophora by Drs. LeConte and Horn. Rather than linger here, we prefer to pass directly to some of the obscurer fields of study.

When we compare the number of insect embryologists in America with that of their European colleagues, the result is somewhat disheartening and discreditable; although perhaps the comparison would be not quite so disproportionate were some of our students to publish their notes. But take all that has been done upon both sides of the water, and what a meager showing it makes. Of how many families of Coleoptera alone have we the embryonic history of a single species? Of two of the four families of Butterflies, the fertile eggs of which are perfectly easy to obtain, nothing is known. In short, one may readily choose numbers of typical groups whose embryonic history would be a great acquisition to science.

Here is a broad field. From the special range of my own studies let me recommend to any one eager for this work to choose the eggs of our common copper butterfly, which she will lay to order on sorrel, and the earlier stages of which can be obtained from the parent at two or three different times of the year; or the eggs of any of our common skippers, which deposit on grass, and which are equally easy to obtain, although only once a year. Or, if we turn to Orthoptera, the eggs of our common *Oecanthus*, concealed all winter in raspberry twigs, are more transparent and more easily obtained than those of any other cricket; and our knowledge of the embryology of any of the *Gryllidae* is very fragmentary, and of this particular tribe, *nil*. Better still, perhaps, would be the choice of our common walking-stick, as it belongs to a bizarre and isolated type, now known to be of very ancient ancestry, and of whose embryonic history nothing has been published. I have, indeed, a few incomplete notes upon this insect, but they relate wholly to a late period of development, and were made before the time of the microtome, when work over such coarse-shelled eggs was very difficult and unsatisfactory. The eggs may be readily procured, the insect being abundant in scrub-oak fields; the mother drops the eggs loosely on the ground, and from imprisoned specimens I have procured scores in a single season. Any one who will glance over the history of what has been done in insect embryology will be able to select a hundred examples as important and as easy to obtain as those already named, and by concentrating his work upon them will do better service than in an aimless selection of what may come to his hand.

In following the post-embryonal history of insects there is work for all. While allied forms have in general a very similar development, there are so many which are unexpectedly found to differ from one another, that every addition to our knowledge of the life histories of insects is a gain, and they are to be praised who give their close attention to this matter. Here is a field any entomologist, even the most unskilled, may cultivate to his advantage and with the assurance that every new history he works out is a distinct addition to the science. The importance of an accumulation of facts in this field can hardly be overestimated, and those whose opportunities for field work are good, should especially take this suggestion to heart. Nor, by any means, is the work confined to the mere collection of facts. How to account for this extraordinary diversity of life and habits among insects, and what its meaning may be, is one of the problems of the evolutionist. There are also here some especially curious

inquiries, to which Sir John Lubbock and others have recently called attention, and to which in this country Mr. Riley has contributed by his history of *Epicauta* and other *Meloidæ*. I refer to the questions connected with so-called hypermetamorphosis in insects. In these cases there are changes of form during the larval period greater than exist between larva and pupa, or even between larva and imago, in some insects. There are also slighter changes than these which very many larvæ undergo; indeed, it may safely be asserted that the newly-hatched and the mature larvæ of all external feeders differ from each other in some important features. The differences are really great (when compared to the differences between genera of the same family at a similar time of life) in all lepidopterous larvæ, as well as in all Orthoptera which have come under my notice. No attempt to co-ordinate these differences, or to study their meanings, or to show the nature of their evident relationship to hypermetamorphosis has ever been attempted.

Not less inviting is the boundless region of investigation into the habits of insects and their relation to their environment. The impulse given to these studies by the rise of Darwinism, and the sudden and curious importance they have assumed in later investigations into the origin and kinship of insects, need only to be mentioned to be acknowledged at once by all of you. The variation in coloration and form exhibited by the same insect at different seasons or in different stations, "sports," the phenomena of dimorphism, and that world of differences between the sexes, bearing no direct relation to sexuality; mimicry also, phosphorescence and its relations to life, the odors of insects, the relation of anthophilous insects to the colors and fructification of flowers, the modes of communication between members of communities, the range and action of the senses,* language, commensalism—these are simply a few topics selected quite at random from hundreds which might be suggested, in each of which new observations and comparative studies are urgently demanded.

The fundamental principles of the morphology of insects were laid down by Savigny in some memorable memoirs more than sixty years ago; the contributions of no single author since that time have added so much to our knowledge, notwithstanding the aid that embryology has been able to bring. Nevertheless there remains many unsolved problems in insect

* Notice Meyer's beautiful studies on the perception of sound by the mosquito.

morphology which by their nature are little likely to receive help from this source. Let me mention three :

The first concerns the structure of the organs of flight. The very nomenclature of the veins shows the disgraceful condition of our philosophy of these parts ; the same terminology is not employed in any two of of the larger sub-orders of insects ; names without number have been proposed, rarely however by any author with a view to their applicability to any group outside that which formed his special study ; and a tabular view which should illustrate them all would be a curious sight. A careful study of the main and subordinate veins, their relations to each other, to the different regions of the wing, to the supporting parts of the thorax and to the alar muscles, should be carried through the entire order of insects ; by no means, either, neglecting their development in time, and possibly deriving some assistance in working our homologies by the study of their hypodermic development.

The second concerns the mouth parts. The general homologies of these organs were clearly and accurately enough stated by Savigny, though one may perhaps have a right to consider the last word not yet said when one recalls Saussure's recent claim to have found in *Hemimerus* a second labium. What I refer to, however, is another point : it relates to the appendages of the maxillæ and the labium. Considering the labium as a soldered pair of secondary maxillæ we have at the most, on either pair of maxillæ, three appendages upon either side. These appendages, as you know, are very variously developed in different sub-orders of insects, or even in the same sub-order ; and it has at least not been shown, and I question if it can be done, that the parts bearing similar names in different sub-orders are always homologous organs. Here is a study as broad and perhaps as difficult as the last.

The third is the morphological significance of monstrosities, especially of such as are termed monstrosities by excess. The literature of the subject is very scattered, and the material much more extensive than many of you may think. At present this subject is, so to speak, only one of the curiosities of entomology, but we may be confident that it will one day show important relations to the story of life.

After all the labors of Herold, Treviranus, Lyonet, Dufour, and dozens of other such industrious and illustrious workers, is there anything important remaining to be done in the gross anatomy of insects ? some of you would perhaps ask. Let the recent work of some of our own number

answer, which has shown in the Hemiptera and Lepidoptera the existence of a curious pumping arrangement by which nutritious fluids are forced into the stomach. It is certainly strange that after all that has been said as to the mode in which a butterfly feeds, that no one should have dissected a specimen with sufficient care to have seen the pharyngeal sac which Mr. Burgess will soon show us. No! the field is still an open one, as the annual reviews clearly show. The curious results of Floegel's studies of the brain, the oddly-constructed sense-organs found by Graber and Meyer (earlier noticed briefly by Leydig) in the antennæ of Diptera, the important anatomical distinctions discovered by Forel in different groups of ants, the strange modification of the tip of the spiral tongue in *Ophideres*, which Darwin, Britenbach and Künckel have discussed, and, above all, the extensive investigations of the nervous system in insects generally, which Brandt has recently undertaken, the exquisite memoir of Grenacher on the structure of the compound eye, and the keen researches of Graber in various departments of insect anatomy, show, by what has been accomplished, how many harvests are still unreaped. The microtome, too, has put a new instrument of precision into the hands of the investigator in this field.

We might in the same way point out some of the special needs in the study of the finer anatomy or histology of insects, but the pressure of other duties forbids a further pursuit of the subject. Enough surely has been suggested, even in this hasty sketch, to show that we cannot yet rest upon our oars, but must push forward undaunted into still unknown waters. If these few words shall arouse in any one a higher ambition, leading to better work, their aim will have been accomplished.

On motion of the Secretary, B. P. Mann, the minutes of the last meeting of the Club were adopted as printed in the CANADIAN ENTOMOLOGIST.

The President read portions of a letter from Mr. Wm. Saunders, of London, Ont., explaining his absence owing to a severe accident, and expressed the great regret felt by all present that Mr. Saunders was not with them, and that his absence was occasioned by so unfortunate a cause.

The election of officers then took place (by ballot) with the following result:—

PRESIDENT—Dr. John G. Morris, of Baltimore, Maryland.

VICE-PRESIDENT—C. V. Riley, of Washington, D. C.

SECRETARY—B. P. Mann, of Cambridge, Mass.

Mr. A. R. Grote, of Buffalo, N. Y., delivered an able and interesting lecture on certain generic characteristics of the *Noctuidæ*, which, it is to be hoped, he will prepare for publication. At the close of his remarks he expressed his anxiety that describers of Noctuids should refer particularly to those parts on which generic characters are based.

Prof. A. J. Cook, of the State Agricultural College, Lansing, Mich., gave an account of recent investigations in Apiculture. Among many other interesting facts he stated that if the wings of the virgin queen be clipped, or the entrance to the hive be so contracted that she cannot fly forth ; or, again, if she be reared where there are no drones, she will not be sterile, but from her eggs only drones will be produced ; that the fate of the drones in a hive depends on the prosperity of the colony—with a rapid increase of bees and honey they are safe, but if there is a period of adversity in these respects, unless caused by the loss or sterility of the queen, they are speedily destroyed by the workers ; that worker bees are imperfectly developed females ; that bees possess and employ the sense of smell, and that they have a good knowledge of locality. In answer to a question from Dr. Morris respecting the alleged robbery of fruit by bees, whether they will not perforate ripe fruits if starved for a time, Prof. Cook replied that he had not tried starvation, but he had placed punctured grapes before bees and found that they would sip the juice with zest, but when he replaced the fruit with sound specimens they did not attempt to touch them.

Mr. Scudder then exhibited some illustrations of rare fossil insects, prepared for publication in Dr. Hayden's report, and a large volume of lithographed plates, colored drawings, &c., of Diurnal Lepidoptera in all their stages, which he had had made to illustrate his proposed great work on the Butterflies of North America.

Mr. J. D. Putnam, of the Davenport Academy, presented some notes on the North American Galeodes (Solpugidæ), and exhibited specimens in illustration.

The Rev. H. C. McCook, of Philadelphia, gave a most interesting lecture on the life history of the Honey Ants of the Garden of the Gods, Colorado, and illustrated it with specimens of the insects and a great number of very large water-color drawings. He described fully the chambers excavated by the ants, the insects themselves in all their forms, their nocturnal habits, and their feeding upon the saccharine juice exuded from the galls of the scrub-oak. He stated that the workers are unde-

veloped females, and that the honey-bearers are a changed form of the worker major with a greatly enlarged crop, in which they store the honey. Mr. McCook has not yet committed his observations to writing, but, we understand, that he will eventually publish them in the proceedings of the Academy of Natural Sciences at Philadelphia. It is impossible to give here even a synopsis of the vast amount of information that he afforded upon this interesting subject.

Prof. Riley remarked, in connection with this subject, that many galls secrete saccharine matter, and that sometimes the gall-insects themselves are entrapped in it; that the ants probably get their honey also from the species of Coccus that frequents the scrub-oaks of Colorado; and that almost all species of ants are able to expand their abdomens when necessary.

Dr. Haldeman observed that the reason why hills were constructed by some ants and not by others was probably because some might have the proper materials conveniently at hand and others not. He urged Entomologists to domesticate ants in order to study their habits, most of which are as yet very imperfectly known.

Mr. Bassett stated that very many species of galls are infested by ants; that he has observed a gall on scrub-oak swarming with ants, and with Cetonia Inda and other honey-loving insects.

Dr. John L. LeConte, of Philadelphia, Pa., read a paper on a collection of Coleoptera obtained from a few hickory twigs. Some hickory trees on a friend's estate, nere Philadelphia, were observed to be diseased and therefore cut down. Some of the twigs were sent to him, and from them he obtained no less than twenty-two species of Coleoptera. He expressed a strong hope that some competent Entomologist should prepare a list of the insects that infest forest trees, and that it should be appended to the report about to be issued by the U. S. Commission on Forestry.

Dr. Morris stated that he also had obtained a considerable number of species of beetles from twigs.

Mr. Haldeman said that the hickory was more infested with insects than any other tree.

Dr. LeConte next read a paper on the so-called "Lightning Bugs" (Lampyridæ):—

Mr. Austin remarked that when a Fire-fly is at rest there is a faint ray of light visible, proceeding from the edge of the segments of the abdomen;

when the insect is emitting the flashes of light it moves these segments and so reveals more of the light.

Mr. Martin stated that he had observed a Fire-fly in a spider's web, and that it emitted very rapid flashes of light at first, but that they gradually diminished in brilliance till at length they died out.

On motion the meeting then adjourned till 8 o'clock p. m.

TUESDAY EVENING SESSION.

At 8 o'clock the Entomological Club met at the Hotel Vendôme, Dr. J. G. Morris in the chair.

Mr. H. F. Bassett, of Waterbury, Conn., gave an account of "the Structure and Development of certain Hymenopterous Galls." He exhibited specimens of galls produced on plants and trees, and spoke of the alternation of two forms belonging to one species. The seminator deposits its eggs in the young acorn, and from the sting or puncture the gall grows, having the appearance of another acorn. This falls to the ground in September, and remains twenty-one months, at the end of which time the gall-flies are produced, which are all females. These females lay their eggs in the buds of the trees in the spring, and from these galls are formed, out of which are developed flies of both sexes. All galls may be divided into two classes:—First, those formed in autumn, which do not develop till the next or a succeeding year, the imagos or perfect insects hatched from them being always females; and secondly, those formed in the spring, the progeny of which are of both sexes. He considered that the woolly substance that covers these galls is an excessive development of the pubescence of the leaf, and thought that the growth of the galls is produced by the action of the poison that is infused by the parent insect when making the sting or puncture, because he often could find in a gall no trace of any larva.

Prof. Riley expressed his opinion that galls are formed both by the poison injected with the egg, and by the irritant action of the larva. He spoke also of the sweet exudation on galls, and remarked that honey-dew is in some cases the natural exudation of the plant independent of the action of insects upon it.

Prof. C. H. Fernald, of Orono, Me., exhibited three volumes recently published by Lord Walsingham on "North American Micro-Lepidoptera, Tortricidæ," illustrated with colored plates, and forming part of the British Museum Catalogues for 1879; also by the same author a volume on the "New and little-known species of North American Tineidæ," and another

on "the Pterophoridæ of California and Oregon." He then proceeded to read a paper on the Classification of Tortricidæ, illustrating his remarks by some wings prepared for the microscope. These slides, which beautifully exhibited the venation of the wings, were mounted with glycerine boiled gently over the lamp; the wings were bleached by Dimmock's process.

Dr. H. A. Hagen, of the Museum of Comparative Zoology, Cambridge, Mass., read a paper on the importation of the Hessian Fly. The generally accepted theory, from which the insect derives its common name, is that the insect was brought from Europe to America about a century ago in the straw used for bedding by the Hessian troops employed by the British Government in the war of the Revolution. This theory Dr. Hagen rejects, and in a sketch of the history of the movement of these troops, he showed that the lapse of time during their transportation was considerably greater than that of the term of the normal development of the fly from the egg. He stated that there was some evidence of the existence of the fly in America before the arrival of the Hessian troops, and that it was unknown in Central Europe till recently; there was, however, some evidence that it may have appeared in certain places on the Mediterranean Coast at an earlier period. He even thought it possible that the fly might have been imported *from* America into the Mediterranean region of Europe by American trading vessels. His conclusions, as stated in a long and very interesting paper, in which he quoted many German and British official records, may be summed up briefly as follows: 1. It is impossible that the fly could have been imported by Hessian troops, as proved by the historical records. 2. The fly must have been in America long before the arrival of the Hessian troops. 3. The fly was not known in Germany before 1857, and is probably an indigenous American insect.

Prof. Riley stated that he had so often noticed a retardation of development in insects, that he should not be surprised if this had been the case with the Hessian fly, when imported. Again, that the "flax-seed state" of this insect lasts so long that it might have crossed the Atlantic during that phase of its existence.

Dr. Hagen replied that Dr. Asa Fitch had already proved the impossibility of this.

Prof. Riley accepted the theory that the fly is indigenous to America, and Dr. Hagen stated that he believed that it is indigenous to both Europe and America.

The meeting then adjourned.

WEDNESDAY AFTERNOON SESSION.

The Club met for an hour at 5 o'clock p. m. in one of the rooms of the Massachusetts Institute of Technology, a large and commodious building which was almost entirely given up to the work of the Association.

The short time at the disposal of the Club was occupied by the continuation of the Rev. H. C. McCook's lecture on the Honey-Ants of the Garden of the Gods, Colorado, the first portion of which he delivered on the previous afternoon. At its conclusion some remarks were made by Prof. Cook and others on birds *versus* insects.

Thursday was devoted by the Association to a visit to Cambridge. Many of the Entomologists took the opportunity of visiting the rooms of the Cambridge Entomological Club, where they were received by Mr. B. P. Mann, the Secretary.

FRIDAY AFTERNOON SESSION.

The Club met in their room in the Institute of Technology at 4 o'clock p. m., Mr. A. R. Grote, Vice-president, in the chair.

Dr. LeConte moved that, owing to a resolution passed at the general session of the Association that morning, the Entomological Club do now organize as a permanent sub-section of the Association; he proceeded to congratulate the Club on the honor thus conferred upon it. It was due to the importance of the subject and the large attendance of Entomologists, no less than to the number of interesting papers offered for their discussion. The resolution was unanimously adopted and the Club at once organized as a Sub-section with the officers elected on the first day of meeting.

Mr. E. Burgess, of Boston, gave an account of the structure of the mouth organs of Butterflies, describing especially and illustrating with diagrams on the black-board, the proboscis, etc., of the Archippus. Remarks were made upon the paper by Dr. Hagen and Messrs. Mann, Cook and Riley.

Dr. Hagen read a paper on the anatomy of *Prodoxus decipiens*, in which he confirmed Mr. Riley's statements.

Prof. Fernald read a paper on *Phoxopteris angulifasciana*, a small Tortrix feeding upon clover.

Mr. O. S. Wescott, of Racine, Wis., gave by request an account of a moth trap for collecting insects by light, which he had employed with much success. Dr. Hoy and Mr. Mann also described insect traps that they had found useful.

Mr. Westcott gave an account of the mode of building its web by a Geometrical Spider, and stated that the insect when forming the concentric lines across the rays measured the distance from the next parallel line by means of its second right fore-leg before attaching the thread to the ray.

Prof. Cook, in answer to a question, stated that he had found a mixture of honey and beer equally efficacious with the ordinary mixture for sugaring.

Mr. Grote remarked that he had found the Colorado Potato Beetle feeding upon a large cultivated variety of Datura, and feared that it would probably soon prove a serious enemy to the Tobacco plant, another member of the family *Solanaceæ*.

Prof. Riley stated that he had found the Colorado Beetle in South Carolina.

The meeting adjourned at 6 o'clock.

MONDAY, AUGUST 30TH.

The Sub-section of Entomology met at the Institute this morning, Dr. J. G. Morris in the chair. For the first time the titles of the papers to be read, with the names of the officers, were published in the Association programme for the day.

Prof. Fernald gave a brief description of his method of preparing and mounting the wings of micro-lepidoptera.

Mr. B. P. Mann gave an account of the contributions of the Cambridge Entomological Club and the progress of Entomology.

Prof. C. V. Riley described the life-habits of certain Bee-flies (Bombyliidæ), and made some remarks on Tree-Crickets and on the early stages of Blepharocera.

Dr. Hagen exhibited a specimen of *Passalus cornutus*, which was entirely destitute of any trace of elytra, but possessed wings and all other parts quite perfect. He stated that it was impossible that the elytra had been artificially removed and that he considered this to be a very rare natural deformity.

Rev. C. J. S. Bethune, in the absence of Dr. Hoy, who was to have read the next paper on the occurrence of *Aletia argillacea* in Wisconsin, stated that he had learned in conversation with Dr. Hoy that this moth had occurred in immense numbers on ripe melons near Racine, Wis., and that he had himself, in the autumn of 1865, taken a great quantity of the

moths feeding on fallen plums and apples, but that ordinarily the moth was not at all common in Ontario.

Prof. Riley considered that the *Aletia* flew to the north when superabundant in its natural home in the cotton growing regions of the South ; that it fed there on some malvaceous plant, lived a year, but not probably longer, and then was no longer to be found in northern localities until another emigration took place when it again became numerous. He did not think that it could possibly live for more than a few generations in the Northern States or Canada.

Mr. Mann was of opinion that it must live for years in the North, finding some suitable food plant, though like very many other insects it was frequently scarce and then suddenly appeared in great numbers.

Dr. Lintner stated that he had found the moth at an altitude of 1800 feet on the Adirondack Mountains, and that Dr. Hoy had informed him that he had taken the larva in June at Racine.

Dr. E. L. Mark described some points in the anatomy of the *Coccidæ*.

The list of papers having been exhausted, the Section now adjourned. to meet next year in Cincinnatti, Ohio.

ON LIGHTNING BUGS.

BY JOHN L. LECONTE, M. D., PHILADELPHIA, PA.

Read before the Sub-Section of Entomology, American Association for the Advancement of Science, Boston, Mass., August, 1880.

Since the publication of my synopsis of Lampyridæ in 1851 (Proc. Acad. Nat. Sc. Phila , 1851, 331), but few species of the family have been described in this country, and no very important improvement has been made in their classification ; about the same time I published in the Journal of the same Society (New Ser., i., 73) a synopsis of Lycidæ, one of the sub-families of Lampyridæ. This last mentioned synopsis is one of my early and crude contributions to science, which, if the study of Natural History had been farther advanced in this country, would have been kindly suppressed, or returned to me for revision In the Classification of the Coleoptera of N. Am., I have established the family with

different limits to those adopted by European writers at that time (1861), and constituted it of the three following sub-families, which are here more fully defined :

Middle coxæ distant, epipleuræ wanting—LYCIDÆ.

Middle coxæ contiguous, epipleuræ usually wide at base, episterna of metathorax with inner margin sinuate—LAMPYRIDÆ.

Middle coxæ contiguous, epipleuræ narrow at base, episterna of metathorax not sinuate on inner margin—TELEPHORIDÆ.

A detail of the minor groups and tribes composing these families would be here out of place, and may be found in my Classification ; they will be fully exposed in a synopsis of the genera and species now ready for press. Otherwise, the habits and life history of a few species have been more or less thoroughly observed and recorded.

For the past few years I have been trying to procure material to enable me to make a more complete synopsis of the genera and species, and a better exposition of their relations to each other than I had been able previously to give.*

For furnishing series of larvæ, pupæ and imagines of species from her vicinity, I am under especial obligations to Mrs. V. O. King, of Austin, Texas. An excellent account of the transformations of *Pleotomus pallens* from her pen has been printed in Psyche iii., 51 (1880), and equally valuable life-histories of other species may be expected in the future.

I congratulate myself, that by the slow progress of my studies and the tardy manner in which some of my correspondents have replied to my request for larger series of specimens, I am now able to profit by the recent publications of Mr. C. O. Waterhouse† on Lycidæ, and Rev. H. S. Gorham ‖ on Lampyridæ.

The object of the present essay is simply to give some popular information in regard to the characters of these insects, and to correlate, so far as our species may permit, the light-giving faculty with other structures ; I will, therefore, not enter here into a close analysis of the relations of the genera.

* I would here mention that no reference is made in the text to the important general work of Lacordaire, or the excellent faunal European work of DuVal, in which the genera have been tabulated in a convenient manner, but without special reference to our species, except what has been derived from my own works cited above.

† Br. Mus. Cat. Illustrations; Coleoptera, Part 1, Lycidæ, 1879.

‖ Trans. Ent. Soc. London, 1880, p. 1, 63, 83, and Proc. loc. cit. infra.

It is then sufficient to say, that none of the Lycidæ or Telephoridæ possess any light-giving organs, and that they are diurnal in their habits. In some of the Lycidæ the front part of the head is prolonged into a beak, and in many of them the elytra are very large, expanded and coarsely reticulated. The peculiar structures of some Telephoridæ will be noticed farther on.

The Lampyridæ proper comprise all the luminous species, though this faculty is possessed by them in a very unequal degree, and in some genera and species of diurnal habits is quite wanting. For our present purposes their division may be indicated into tribes and groups as follows :

A. Side pieces of metathorax narrow ;

a. ♂ and ♀ similar or nearly so ; antennæ long, last joint simple.

b. ♂ and ♀ conspicuously different ; antennæ short, last joint with acicular appendage.

B. Side pieces of metathorax wide (♀ unknown) ; palpi very unequal, mouth organs more developed.

The series A *a* contains the largest number of genera and species, and exhibits a gradation from *Matheteus*, with widely separated pectinate antennæ, and general Lyciform appearance, through *Photinus*, with approximate filiform antennae, and head retracted under the prothorax, to *Photuris*, with the antennae filiform, and the head partly exposed. There is thus a continuous line of affiinities in this series from the diurnal Lycidae to the diurnal Telephoridae.

Now besides the gradations in structure just mentioned there are great differences in the sizes of the eyes, and in the development of the light organs. In the species usually seen flying by day (*Lucidota*, *Elÿchnia*, &c) the light organs are indicated by feeble yellowish spots on the last ventral segments, but do not seem to possess any light-giving power ; in these the eyes are lateral, rather small in ♀, but larger and more convex in ♂ ; they are widely separated above and beneath as in Lycidæ.

The series A *b* contains a much smaller number of genera, and in them the antennæ are approximate, usually filiform, rarely (*Pleotomus*) bipectinate. The number of joints varies from 9 to 14, and the last joint has at the end a small acicular appendage simulating an additional joint. The eyes of the ♂ are excessively large, almost contiguous above and beneath, leaving very little room for the mouth and antennæ ; in the ♀ the eyes are moderate, or even small, lateral and widely separated. The

light organs are varied, sometimes brilliant in both sexes, sometimes weak in both sexes, and sometimes brilliant only in the ♀. Their food consists of small terrestrial mollusca.

The third category, B, consists of *Phengodes* and allied genera in which the side pieces of the metathorax are wide. I know nothing by observation of the luminous qualities of these insects, of which only males are known. They are all rare, and I have seen none alive. But we here owe our special thanks to Mrs. King for the patient quest which has been rewarded by the discovery of the pupa of *Phengodes*, and which will probably result in another season in the detection of the larva.*

I am also indebted to Mrs. King for a larva of *Mastinocerus*, of slender, cylindrical form and pale color. It was feebly luminous, and lived upon small snails. The perfect insect is thus mentioned in a letter, the observations being made upon a specimen attracted by the lamp: "June 4th saw running rapidly over the table near a lighted lamp, a small Coleopter; it was twisting its abdomen up over its wings, and evidently trying to straighten them out, as they seemed moist and twisted at their ends. The general appearance suggested *Mastinocerus*, and acting on this thought, I captured it and sat up till a late hour to be assured of the truth. The insect was in a small vial, and moved quickly. It gave out light conspicuously from the head, feebly from the anal end, and still more so from about the base of the abdomen. The light seen in the head, though visible in the dark as a round spot, yet when taken into a room obscurely lighted was invisible from above; but when the insect was suddenly thrown upon its back a light no larger than a pin point was seen just about the junction of the head and prothorax." . . .

It is quite possible that the genera of the other continent constituting the sub-family Drilidae should be placed as a group of this series; but upon this point I cannot speak with confidence, as I have had no opportunity of studying them carefully. They live on snails, and some of them pass through their transformations in the shells of the animals upon which they have fed.

* It is still uncertain whether the large luminous larvæ described by Baron Osten Sacken (Proc. Ent. Soc. Phila., i., 125, pl. 1, f. 8) belong to the Elateride *Melanactes* or to *Phengodes*. Species of both genera are found in nearly all parts of the United States, but though the larvæ seem to resemble that of *Mastinocerus* referred to in the text more than any described Elateride larva, it is more probable that they should be referred to the latter family.

As regards the third sub-family, Telephoridae, it is merely necessary to mention that the eyes, without being excessively large in either sex, are invariably larger in the ♂ than in the ♀, and that in the lower forms (*Malthodes*, &c.) there is an extreme complication in the development of the last abdominal segments.

We have, then, in Lycidae a tendency, with simple sexual characters, to elongation of the anterior part of the head. In the Lampyridae the sexual characters are diffused over the whole body, but with no tendency to elongation of the head or complication of the posterior abdominal segments; and in addition there is a peculiar apparatus for the emission of light, which although absent in some genera, does not exist at all in the other two sub-families.

Finally, in Telephoridae there is a slight reminiscence of the anterior extension of the head in certain species of *Podabrus*, which have a broad muzzle. In general the mouth organs are more powerful than in the other sub-families. The sexual characters are of an ordinary kind, but in *Chauliognathus* and *Malthodes* the last abdominal segments of the ♂ are largely developed. In some species of the last named genus the complication of these rings resembles nothing that I know in nature, except the curious structures of Tipulidae figured by Osten Sacken.* In *Ichthyurus*, an Asiatic genus, the middle legs of the ♂ are singularly inflated; and in *Silis* there are curious processes near the hind angles of the prothorax; a very deep fissure limited on each side by a prolongation, and complicated by a moveable articulated process attached to the inflexed flank of the prothorax. In several species this articulated process terminates in a long bent filament, and the apparatus probably serves like a somewhat similar one on the first antennal joint of the ♂ of the Malachide *Collops*, to clasp the antennæ of the ♀.

After this statement, which is as brief as I can make it, of the arrangement into sub-families and tribes of the Lampyridæ, with the principal modifications of structure in each, we are prepared to consider the variations in the light organs, and their sexual correlation with the eyes and wings in the Lampyridæ proper.

We have seen that the greatest development of the eyes takes place in the male of the series A *b*, or Lampyrini, in which the antennæ are very short in both sexes. The female is without wings, and has the eyes

* Proc. Acad. Nat. Sc. Phila.,' 1859, 197, pl. 3 and 4.

moderate (*Phausis*), or very small (*Microphotus*). The light organs are either brilliant in both sexes (*Phausis reticulata*), wanting in the male (*P. inaccensa*, female unknown), feeble in male and brilliant in female (*Pleotomus*, and probably *Microphotus*). In the Photini the light organs are completely wanting (*Tenaspi.*, n. g.), obsolete and ineffective (*Lucidota*, *Ellychnia* most species); well developed in both sexes, but more brilliant in male than female (*Pyractomena*, *Photinus*); equally brilliant in both sexes (*Photuris*): in all these the antennæ are long, either slender or broad, and closely approximate; the eyes are widely separated on the upper side, and usually also beneath. In *Matheteus* and *Polyclasis* the antennæ are pectinate, or bipectinate, and rather widely separated; the eyes are more distant, and the light organs wanting.

The Phengodini are known only by the male. The eyes are lateral, convex, moderate in size, and widely separated; the antennæ are distant at their insertion, plumose in *Phengodes* and *Zarhipis* (n. g.); bipectinate in *Mastinocerus* and *Cenophengus* (n. g.); pectinate in *Pterotus*, and serrate in *Tytthonyx*, if I am correct in associating that genus with this tribe. *Phengodes* is said by Lacordaire* to be luminous, while the observations of Mrs. King above cited prove that *Mastinocerus* is also phosphorescent.

From this detailed statement it may be inferred that there is no distinct correlation between the eyes, the antennae, and the light organs of the two sexes which obtains for the whole sub-family.

That the eyes of the male should in comparison with the other organs of special sense, the antennae, be more largely developed than in the female, is explicable from the more generally active disposition of that sex, but that these characters should prevail in the contradictory categories, where the female is more brilliant, and where she is less brilliant than the male, does not seem to me explicable either on grounds of teleology or natural selection, and especially do these explanations seem imperfect when we consider that the largest eyes are possessed by those males which seek the most brilliant, but also the most helpless females.

The luminous powers of these insects suggest three distinct investigations, which seem to me very important, and to which I would earnestly invite the attention of my colleagues in other branches of science:

1st. Spectroscopic examination of the nature of the light, and an

* Gen. Col., iv., 345.

analysis of the elements concerned in producing such brilliance at low temperatures.*

2nd. Biological observation of the particular arrangement of cells, which enables such an amount of light of a high grade to be produced by the metamorphosis of ordinary tissues, without the heat of incandescence.†

3rd. Chemical analysis to determine the nature of the proximate principles which are thus oxidized in the production of light without heat.‡

None of these researches can be conveniently made in the Northern States, but in the Middle and Southern States, and especially in tropical America, they can be readily entered into, and none of them fall properly within the sphere of investigation of Entomologists.

It is unnecessary for me to expand on the scientific value of the investigations here proposed. Luminosity of a much lower grade than that exhibited by these insects has been generally ascribed by physicists to matter at very high temperatures, even in the cases of Auroræ and Nebulae; and in fact the experiments of Mr. Crookes upon radiant matter under the influence of electrical currents would tend to confirm such a supposition.

Should, however, the investigations I have suggested justify the belief, as seems probable, that large evolution of highly refrangible light may take place without high temperature, our cosmical theories may need to be partially modified. And should the chemist ascertain with accuracy what precise combination of molecules of the ordinary constituents of

* Some slight efforts have been made in this line of investigation, but nothing satisfactory has been published. Mr. Meldola (Proc. Ent. Soc. London, 1880, p. iii), observes: "that the exact nature of the phosphorescence was still an unsolved problem both to the physicist and biologist. Some years ago he had examined the spectrum of the glow-worm, and found that it was continuous, being rich in blue and green rays, and comparatively poor in red and yellow."

† In regard to the structure of the light-giving organs, I have found only some superficial notices by authors whom it is scarcely necessary to cite on the present occasion. It is narrated that they are rich in fat cells, and abundantly supplied with nerves and air-tubes; the histological observations of Schultze do not show the manner in which the light is produced.

‡ As to the composition of the fats contained in these special organs, I believe that no investigation has been made, though in this instance, as in the cases of the acid secretion of *Harpalus*, the liquid explosively emitted by *Brachinus*, and the singular excretion of *Chlaenius*, which combines the odor of camphor and kreasote, the materials are easily procured, and the results would be physiologically important.

organic bodies will thus by slow oxidation give such a disproportionate amount of light, we may enter upon a path which leads to the accomplishment of one of the great desires of civilization, the production of light, without undue expenditure of energy in the development of heat, as a waste product.

In regard to the manner in which the light is evolved, I have but little information to give, though what I say may serve to correct some erroneous views which have been elsewhere expressed.

The popular name of these insects, *lightening* (or lightning) *bugs*, as distinguished from *fire flies*,* is derived from the fact that the light is intermittent. It is never entirely extinguished, but is paroxysmally weak and brilliant. When seized, under the influence of fear, the intervals become irregular, and the flashes are frequent. When put into alcohol there is at first a fitful and rapid exhibition of light, but afterwards the light becomes moderate and permanent for some minutes. When the light organs are separated and crushed, the light also continues for some time, becoming gradually weaker.

I therefore infer that the excitement of the light-giving organs to the highest degree of activity is manifested by the supreme effort of the will of the animal, and that the exhibition of light is dependent upon a particular structure, more or less under the control of the will, but containing a special material capable of evolving the light independent of the will. In a similar way to that in which the voluntary muscles of all animals evolve motion, and the special electrical organs of certain fishes evolve electrical currents, so do these organs of the Lampyridae evolve light from some peculiarly constituted structure fitted for the purpose.

It may be conceded, after what has been said above, that the idea of Mr. Gorham,† that "the external white vitreous parts are diaphanous, and permit the light to shine through," is perfectly correct, but that his belief that "the source of light within the body of the insect can be pressed against these windows, or retired from them at its pleasure," is quite without foundation.

* Fire flies are Elateridæ of the genus *Pyrophorus* (Spanish *Cucuyo*), of which one of the smaller species, *P. physodes us*, occurs in Florida and Texas, and shine with a constant light, chiefly visible in two vesicles near the hind angles of the prothorax, which are convex, and covered with a transparent chitinous integument. All species of *Pyrophorus* are not phosphorescent.

† Trans. Ent. Soc. London, 1880, p. 66.

Several authors have remarked upon the tendency of the winged Lampyridae, in countries where large numbers of the same species are in view at one time, to exhibit their light at rhythmic intervals. I have never observed this in the United States, nor in those parts of tropical America which I have visited. I think that, in this respect, there must be great differences in the habits of the species. In travelling by night on railroads in the Middle States, I have frequently seen in low and moist lands near the road many thousands of these insects (chiefly *Photuris pensylvanica*), which sparkled and twinkled to such an extent that one might imagine himself on the Glittering Heath* itself, on which the hero of the great epic of our race achieved his first victory, and gained his double prize. But I have never seen any approach to a rhythmic effect in these sparklings, as described in the books.

The causes to which this singular phenomenon are ascribed are either physical or physiological.† In order that my readers may give these

* But lo! at the last a glimmer, and a light from the West there came,
And another and another, like points of far off flame;
And they grew and brightened and gathered, and whiles together they ran
Like the moon-wake over the waters, and whiles they were scant and wan.
—Sigurd the Volsung, Book II, p. 137.

† Proc. Ent. Soc. London, 1880, p. ii., Mr. McLachlan . . "had at that time advanced the opinion that the phenomenon in question might be caused by currents of air inducing the insects to simultaneously change their direction of flight." Sir Sidney Saunders: "The simultaneous character of these corruscations among vast swarms would seem to depend upon an intuitive impulse to emit their light at certain intervals as a protective influence, which intervals became assimilated to each other by imitative emulation."

Ibid, p. vii.: "Mr. McLachlan, in connection with his idea of the supposed contemporaneous flashing of all the individuals in a swarm of Lampyridæ, called attention to flies of the genus *Argyra*, which when flying exhibited at times an appearance similar to that of small snow-flakes, owing to the silvery pubescence with which part of the body was clothed, but which was observed in certain positions, and especially when the insects rested, owing to the pubescence being then concealed; he thought this to some extent was an analagous case to that of the light of swarms of Lampyridæ." Sir Sidney Saunders observed: . . . "as to the contemporaneous flashes of myriads, such as are more frequently congregated on the calmest nights, surrounding objects previously involved in obscurity, become suddenly illuminated as if by electricity, and as rapidly plunged into their antecedent gloom at alternate intervals. He could not concur in the hypothesis that currents of air had any connection with such displays or exhibitions, when not a breath was stirring around; nor that these manifestations might be evoked

views due weight, I have cited them at some length in the foot note. My own impression is that Mr. Belt and Sir Sidney Saunders have given, between them, the true explanation of the rhythmic exhibition of light, and that apart from the aesthetic realization in nature of this plan of making night glorious by the wonderful brilliancy of such insignificant objects (upon which idea this is neither the time nor the place to discourse), it is primarily a defence of the insects against danger, and is secondarily caused by that tendency to act in concert or imitation which operates upon all sentient beings. This tendency may be equally observed in a flock of sheep following its leader, a school room of hysterical girls, a political meeting, a spiritistic séance, or a hyper-sentimental religious assemblage. And I regard all these occurrences, however differing in the importance of their final results, as individual instances in a large class of similar phenomena, caused by aggregated sympathy.

I would therefore agree with Sir Sidney Saunders and Mr. Meldola in quite rejecting Mr. McLachlan's view that it is produced by a change in position of the insects caused by currents of air, or even voluntary movements in direction of flight.

To recur to the process by which the light is produced, I would add to what I have said in the beginning of this essay, that the chemical processes possible in the bodies of Lampyridae can be scarcely if at all different from those which take place in neighboring and closely allied tribes. We may therefore infer from the observations of Mr. Meldola that the ordinary metamorphoses of tissues, by the aid of some slight modification of composition and cellular structure, are capable of evolving light, which belongs to the upper end of the spectrum, such as is generally significant of the highest temperatures.

It is therefore the more extraordinary to find in these insects light of a high order not dependent on elevation of temperature, and consequent

by sexual influences, amid vast hosts instigated to combine therein, and act in unison. He would rather attribute this phenomenon to an inherent tendency to emit their light from time to time, requiring a certain amount of repose to recruit their powers; and when any thus surcharged felt intuitively inspired to take the initiative, the others—prompted to obey a corresponding influence—followed such suggestion in responsive sequence." Ibid, p. viii.—"Mr. Meldola stated that Mr. Thomas Belt (Naturalist in Nicaragua, p. 320) had expressed his belief that the luminosity of the Lampyridæ played the same part as the bright colors of many caterpillars, *i. e.*, that it served as a danger signal, warning nocturnal foes of the inedibility of the species of this family, which he had found to be generally distasteful to birds, &c."

waste of energy in heat. For it must be observed, that while in one sense heat is the cause of all the phenomena we perceive, since they all have existence only within certain ranges of temperature, in another sense heat is frequently a waste product, and the only one by which the dissemination of energy occurs so as to become imperceptible.

I am aware that the sketch I have here given of the present condition of our knowledge of Lampyridae has been written to the demonstration of my own ignorance (and that of all other students) in regard to some of the most important questions involved. But if I succeed in causing you to look upon these remarkable insects with more interest than you have previously felt, neither my time in preparing, nor your time in listening to this essay, will have been wasted.

I would especially invite the attention of the younger observers in entomology, who have to pass through the labor of patient field work and close observation of habits, before they can ascend with profit to the higher retirement of the museum and the library, to contribute more fully to our knowledge of the development and habits of the different species.

I would equally ask the attention of my colleagues, who by long training in refined experimental research are qualified for such investigations, to the solution of the physical and chemical problems suggested by the singular production of high light without heat by these animals, which are within such easy reach. And by the solution of these problems I am convinced that our knowledge of molecular physics will be increased, and our powers of theorizing less fettered by conventional ideas.

ON THE SYNONYMY OF NORTH AMERICAN NOCTUIDÆ.

BY A. R. GROTE.

I have recently been favored by Mr. Tepper and Mr. Graef with the sight of some of Mr. Morrison's types of Noctuidæ. A few of the specimens are in poor condition, too poor, I think, to have allowed them to serve as types. Others are in good order, and those I have here noted are quite easily recognizable. It will be thought extraordinary, from the determinations, that Mr. Morrison should have allowed himself to criticize

any one for overlooking structural features in this group, or for re-describing species. I am of opinion that the short descriptions of Agrotids published by Mr. Morrison in Bost. Proc., Dec., 1874, are too brief and misleading to be cited. The species are hastily compared with others to which they are not closely related, as *saxigena* with *sigmoides*, whereas *saxigena* is, in my opinion, the same as *imperita* Hubn., from Labrador, a very different species. In every case, as far as I know the species, these comparisons are wide of the mark and consequently deceptive, and since the other characters given are very short, it renders the identification of the species intended improbable, if not impossible. It is necessary to observe the structure of the front, eyes, and the armature of the legs, in order to present intelligible descriptions in the Noctuidæ. In addition to his frequent failure to do this, Mr. Morrison uses such terms for color as "gray" and "yellow" in a manner which, to me at least, is misleading. There is an air of exactness about Mr. Morrison's definitions which I do not find justified on examining his types.

Schinia media Morr., Proc. Bost. S. N. H., 123, 1875.

Under this name Mr. Morrison has re-described *Plagiomimicus pityochromus* Grote, Bull. B. S. N. S., I., 182, 1873. The genus differs from *Schinia* by the frontal structure and very decidedly: *Polenta* Morr. is a closely allied form, and probably the genera are not sufficiently distinct. The markings of the two species *pityochromus* and *Tepperi*, show much the same pattern.

Ceramica rubefacta Morrison.

Under this name Mr. Morrison has re-described *Mamestra vindemialis* Guen. and Grote. *Mamestra congermana*, described by Mr. Morrison as a Hadena, but which has hairy eyes, is allied to *vindemialis*.

Luceria loculata Morr., Bull. B. S. N. S., II., 110, 1874.

Under this name Mr. Morrison has re-described *Hadena passer* Guen.

Agrotis perquiritata.

Polia perquiritata Morr., Proc. Bost. Soc. N. H., 136, 1874.

Mr. Morrison's description of this species, which has the tibiae armed

and resembles the European *Agrotis speciosa*, as a *Polia*, a genus in which the tibiae are unarmed, must be my apology for having recently re-described the species as *Agrotis Baileyana* in the pages of the North Am. Entomologist.

Mamestra thecata Morr., Proc. Ac. N. S., Phil., 59, 1875.

This is *Graphiphora (Taeniocampa) contrahens* Walk., sp. as determined in the D'Urban collection. Where Walker described it is not known to me at this time. It is not a *Mamestra*, but a *Graphiphora*.

Mamestra curta Morr., Ann. N. Y. Lyc. N. H., 96, 1875.

Orthosia perpura Morr., Proc. Ac. N. S., Phil., 66, 1875.

These two are identical, the habitat of *perpura* being erroneous. The species is *Anarta nivaria*, thus twice described by Mr. Morrison, once under *Mamestra*, in which genus the eyes are hairy, and once under *Orthosia*, in which they are naked.

Hadena norma Morr., Can. Ent., 7, 216.

Lithacodia penita Morr., Proc. Ac. N. S., Phil., 71, 1875.

This is *Eustrotia mariae* Grote, a frail species, varying much in size. It is certainly not a *Hadena* or a *Lithacodia*, but belongs, I believe, to *Eustrotia (Erastria)*. *Penita* is a dark specimen, but evidently the same thing. Mr. Morrison's generic references are confusing.

Actinotia derupta Morr., Proc. Ac. N. S., Phil., 62, 1875.

This is *Prodenia phytolaccae* A. & S.

Orthosia differta Morr., Proc. Ac. N. S., Phil., 67, 1875.

This is a re-description of *Pyrrhia illiterata* Grote, Proc. Ac. N. S., Phil., 211, 1874. I think *aurantiago* Guen., not very fully described, is an older name for this species.

Polia aspera.

Acronycta aspera Morr., Proc. B. S. N. H., 132, 1874.

Polia diffusilis Harvey, Can. Ent., 10, 56.

Mr. Morrison compares his species with *Acronycta subochrea*, than which nothing could be more misleading, and sufficiently excuses the re-description of the species. The type is a female in poor condition, and

undoubtedly belongs to Dr. Harvey's species, which by its gray color recalls the species of *Apatela* or *Acronycta*.

Caradrina meralis Morr., Can. Ent., 7, 215.

I have, unfortunately, re-described this species as *C. bilunata*, Can. Ent., 9, 199.

Tarache obatra Morr., Proc. Bost. S. N. H., 124, 1875.

This is evidently a species of *Spragueia* allied to *Spragueia plumbifimbriata*; it would be quite impossible to recognize the fact from the description and comparisons of Mr. Morrison.

Agrotis personata Morr., Proc. Bost. Soc. N. H., 238, 1876.

This is a dark specimen of *Agrotis pityochrous* previously described by me.

Agrotis manifestolabes Morr., Proc. Bost. Soc. N. H., 166, 1874.

This is a synonym of *Agrotis (Matuta) Catherina*, Grote, Can. Ent., 116, 1874. I have evidently been in error in considering my type a male and also in proposing a new genus for its reception. The male antennae are pectinate. The female type is photographed Can. Ent., vol. 7. It passed from my hands immediately after description, which prevented my making any comparison or re-examination. Since then I have seen the ♀ *manifestolabes* in Mr. Tepper's collection, and it is evidently my *Catherina*.

Taeniocampa confluens Morr., Proc. Bost. S. N. H., 159, 1874.

Mr. Morrison's type is a little smaller, but color and markings are much like ordinary specimens of the common *incerta*. The stigmata run together, but they approach very closely and sometimes touch in *incerta*; there is nothing like such a fusion of the spots as we see in *normalis* in Mr. Morrison's type, and I think the specimen cannot be distinct from *incerta*. Certainly there should have been some hesitation in naming the species in view of the known variability of *incerta*, with which Mr. Morrison does not compare it or appear aware of its close relationship, if not identity. *T. pacifica* Harvey has been collected in Texas by Belfrage, and is, I think, distinct from *incerta*.

On page 58, of vol. 7, of the CANADIAN ENTOMOLOGIST, I gave a list of Mr. Morrison's synonyms in the Noctuidae then known to me. I have since then become acquainted with more of Mr. Morrison's species, many of which appear to me undoubtedly valid and well described. Difficulties were thrown in my way in my endeavor to find out what Mr. Morrison's descriptions covered. There still remain a considerable number of Mr. Morrison's species which I cannot identify and would like to know, to enable me to place them in a new List of our Noctuidae upon which I am at work. The following is the list of synonyms I have made out:

Hadena anecocisconensis Morr. = *Hyppa xylinoides* Guen.
Hadena norma Morr. = *Lithacodia penita* Morr.
Luceria loculata Morr. = *Hadena passer* Guen.
Ceramica rubefacta Morr. = *Mamestra vindemialis* Guen.
Mamestra thecata Morr. = *Graphiphora contrahens* Walk.
Orthosia perpura Morr. = *Mamestra curta* Morr.
Panthea leucomelana Morr. = *Audela acronyctoides* Walk.
Mamestra illabefacta Morr. = *Mamestra lilacina* Harvey.
Actinotia derupta Morr. = *Prodenia phytolaccae* A. & S.
Orthosia differta Morr. = *Orthosia aurantiago* Guen.
Orthosia baliola Morr. = *Gortyna purpuripennis* Grote.
Copipanolis vernalis Morr. = *Eutolype Rolandi* Grote.
Xanthoptera nigrocaput Morr. = *Exyra Ridingsii* Riley.
Schinia media Morr. = *Plagiomimicus pityochromus* Grote.
Schinia var. *oleagina* Morr. = *Schinia gracilenta* Hubn.
Mamestra rufula Morr. = *Mamestra lubens* Grote.
Acronycta pudorata Morr. = *Acronycta grisea* Barns.
Agrotis manifestolabes Morr. = *Agrotis Catherina* Grote.
Agrotis perpura Morr. = *Agrotis euroides* Grote.
Agrotis personata Morr. = *Agrotis pitychrous* Grote.
Agrotis opipara Morr. = *Agrotis islandica* Staud.
Agrotis scropulana Morr. = *Agrotis carnea* Thunb.
Mamestra teligera Morr. = *Mamestra vicina* Grote.
Chariclea pretiosa Morr. = *Cirrhophanus triangulifer* Grote.
Telesilla vesca Morr. = *Galgula subpartita* Guen.
Taeniocampa confluens Morr. = *Graphiphora incerta* Hubn.
Agrotis saxigena Morr. = *Agrotis imperita* Hubn.

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ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

GENTLEMEN,—The past season has not been very eventful in Ontario in matters relating to insect life. No unusual armies of insect enemies have devastated our crops, and our farmers and fruit-growers, in spite of the few perennial foes, which are always more or less troublesome, have realized a bountiful harvest.

Early in the season cut-worms were very numerous in the neighborhood of London, more abundant then I ever remember seeing them before. They destroyed innumerable cabbage plants and other herbaceous plants and flowers; among the latter pansies seemed to possess great attraction for them. I saw many fine plants of this flower of the previous year's growth eaten close to the ground, both leaves and stalks, and from about the roots of a single plant found in several instances from thirty to fifty of the nearly full grown larvæ. Fortunately their period of activity does not last long, and before the end of June most of them were quietly sleeping in the chrysalis state.

The question of insectivorous birds, and their influence on the insect world about us, is attracting much attention, and the more the subject is discussed the more evident it becomes that very little indeed is *known* in reference to it; that our ideas as to what should guide us are largely inherited, or otherwise based on sentiment, rather than resting upon well ascertained facts. I am well aware that to plead in favor of the birds is a popular course to follow; but the true student of nature is ever seeking after truth, and whether the facts he discovers are in accord with long cherished opinions and popular fancies, or are directly opposed to them, are questions of little moment. The facts, whatever they may be, are what we want.

Insectivorous birds may be conveniently divided into three classes: First, those which take their food entirely on the wing; second, those which feed partly on the wing and partly from trees and shrubs, and on the ground; and third, those which take no food on the wing, but feed

entirely either on the ground or from trees or shrubs. In the first class, besides some rare birds which we do not need to mention here, the following are found common in most parts of our Province : the swallows, *Hirundinidæ ;* kingbird, *Tyrannus Carolinensis ,* pewee, *Sayornis fuscus,* and nighthawk, *Chordeiles popetue.* The food of these birds consists chiefly of flies, a large proportion of which cannot be said to be either noxious or beneficial ; many of them in the earlier stages of their existence live in the water, where they devour decaying vegetation or feast on the lower and simpler forms of animal and vegetable life. The larvæ of many others are scavengers, devouring decaying or putrescent animal and vegetable matter, and hence well deserve to be classed with beneficial insects. In the same class of friendly species will rank a considerable number of others which are parasitic on the bodies of caterpillars, also the rapacious species who sustain themselves by devouring the weaker and less vigorous of their race. A few rare exceptions, of which the wheat midge and Hessian fly may be noted as examples, are very injurious to field crops, while the mosquito and black fly are universally branded as enemies to the human race. These birds also devour a few butterflies and moths, but these, with few exceptions, are harmless. The question, then, to what extent these purely insectivorous birds are beneficial to the farmer or fruit grower, reasonably admits of much difference of opinion, for while they do devour a few of our tormentors, they probably destroy a much larger number of beneficial insects, the main bulk of their food, however, consisting of harmless species. Doubtless they serve a purpose in maintaining a proper balance among the insect hosts, and between animal and vegetable life, but that their service in these departments is so all-important as some would urge admits of grave doubt.

The birds of the second division, namely, those who take their food partly on the wing and partly from trees and shrubs, or on the ground, are not entirely insectivorous. The remarks just made in reference to the first class will apply also to this as far as their food is taken on the wing, but on trees or shrubs, or on the ground, they consume insects of entirely different classes, chiefly beetles and the caterpillars of moths and butterflies. The beetles admit of a similar division to that of the flies already noticed ; the larger number are harmless, a large proportion of the remainder are beneficial, and a few are injurious. Most of the caterpillars of moths and butterflies are harmless, feeding in limited numbers on a great diversity of shrubs and trees of little or no economic importance.

A few may be said to be beneficial, in consequence of their feeding on troublesome weeds, such as thistles, etc., while a few others are decidedly injurious. Among the common birds in this second class I would mention the yellow warbler or spider bird, *Dendroeca æstiva;* the red start, *Setophaga ruticilla;* the red-eyed and yellow-throated vireos, *Vireo olivaceus* and *V. flavifrons;* the various species of woodpecker, *Picidæ*, and the blue bird, *Siala sialis.*

The birds comprised in the third class are only partially insectivorous. Among the common species are the cat-bird, *Galeoscoptes Carolinensis;* robin, *Turdus migratorius*, and brown thrush, *Harporhynchus rufus;* the sparrows, *Fringillidæ;* the cuckoos, *Coccidæ;* the nuthatch, *Sitta Carolinensis;* chickadee, *Parus atricapillus;* kinglets, *Sylviidæ:* meadow-lark, *Sturnella magna;* Baltimore oriole, *Icterus Baltimore*, and the wren, *Troglodytes ædon.* Besides these there are the blackbirds, *Icteridæ*, which in the spring devour more or less insect food, but feed chiefly on grain and seeds during the remainder of the year. Nearly all birds, excepting the rapacious species, feed their young on such soft food as worms, caterpillars, soft-bodied insects and fruit, and from the time that young birds are hatched until they acquire the power of flight, a very large quantity of insect food is undoubtedly consumed ; but the question of the greatest practical importance to the agriculturist is how far are the birds a help in keeping in check *injurious* insects. With the object of obtaining light on this point, I have, with the help of my son, W. E. Saunders—who has for some years paid special attention to this matter—examined the contents of the stomachs of a large number of birds, and I must frankly confess that the larger the experience gained in this direction the more I have been convinced that but comparatively little help is got from birds in keeping in subjection injurious insects.

When the cut worms were so common with us this spring that any bird with a very little effort might have had its fill of them, the contents of a number of stomachs were examined, especially those of the robin, but not a single specimen of this larva was found in any of them. It has been urged that some birds devour the larvæ of the plum curculio by picking them out of the fallen fruit, but I have failed to find any confirmation of this statement, indeed never found a curculio larva in the stomach of any bird excepting once in that of a robin, who had evidently swallowed it by accident when bolting a whole cherry. As for the robin having any claims upon the sympathies of man for the good he does, I

fear that but a very slight case can be made out in his favor. Of fruit he is a thief of the worst kind, stealing early and late, from the time of strawberries until the last grapes are gathered ; not content to eat entirely the fruit he attacks, but biting a piece out here and there from the finest specimens, and thus destroying a far greater quantity than would suffice to fill him to his utmost capacity. At the time of writing, flocks of the most pertinacious specimens are destroying the best of my grapes, while alongside is a patch of cabbages almost eaten up with the larvæ of the cabbage butterfly—nice, fat, smooth grubs, easily swallowed, but no such thing will Mr. Robin look at as long as good fruit can be had. His tastes are so expensive that to gratify them is to deprive the fruit grower of a large portion of his profits, hence the sooner the robin ceases to be protected by legislation the better it will be for all lovers of fruit.

The insect world is composed of myriads of specimens which from their varied structure and habits admit of being classified into families, each distinct and usually easily recognizable to the practiced eye of the Entomologist. A large portion of this innumerable host is appointed to prey upon and devour the other portions, and thus it appears to me that apart from any consideration of insectivorous birds, that the insect world would and does to a large extent take care of itself, and when an injurious species increases beyond its normal limits, its natural insect enemies having an unusual amount of material to work on, soon become sufficiently numerous to reduce the number of the injurious insect to its normal proportions again. As an illustration take the now common cabbage butterfly, *Pieris rapæ*. This insect was in some way brought from Europe to Quebec a few years ago. From Quebec it has since spread over an immense area extending now from Alabama to the waters of Lake Superior, eastward to the Atlantic, and westward many hundreds of miles, and over all this district it has done immense damage to the cabbage crop. Throughout this area insectivorous birds of all sorts prevail ; the butterfly is conspicuous, not very strong in flight, and during the day almost constantly on the wing ; the larva feeds in exposed situations, is of that smooth character which birds are said to prefer, and although similar in color to its food plant, is not difficult to detect. Here, then, is an instance where a comparatively feeble insect, particularly vulnerable to attack, has rapidly spread over a large portion of this continent with little or no opposition from insectivorous birds. Indeed I have never yet found or known to be found a single example either of the butterfly or

its larva in the stomach of any bird. In its native home in Europe it is seldom so very destructive as here, for the reason that a small four-winged fly, *Pteromalus puparum*, an insignificant looking little creature, is a parasite on the larva of this butterfly, and hunts its victims with the greatest assiduity; alighting on their backs and thrusting its slender ovipositor through the skin of the larva, it deposits a number of eggs there, which hatch into tiny grubs, and these feed upon and eventually destroy the caterpillar. By the constant efforts of this little parasite the cabbage butterfly is prevented in Europe from becoming a very serious pest. Fortunately this little friend has also been introduced here from Europe, although in what manner is not known, and is rapidly spreading, following in the wake of its prey, and where the parasite has fairly established itself this butterfly, with its numerous progeny of green caterpillars, soon dwindles in numbers so materially as shortly to cease to be so grievous an evil. The butterfly spreads faster than its enemy and is usually several years in advance of it, but we may confidently anticipate that sooner or later this small fly will do for us what it has done for Europe—keep this troublesome insect within due limits. Many other similar examples might be given.

Further, the help of friendly parasitic insects is so much more efficient because it is in most instances discriminating. As far as is known, the little parasite referred to attacks only the larva of the cabbage butterfly, and in like manner many other parasitic species are restricted in their operations to a single species, while in other instances they are confined to a genus or a group of similar species. This is not so with insectivorous birds; they in most instances devour alike the useful and the injurious species, and the question may well be raised in many instances whether the good they do is not more than counterbalanced by the number of useful insects they devour. Recent observations on the family of thrushes by Mr. S. A. Forbes, of Illinois, seem to show that their insect food consists largely of beetles belonging to the Carabidæ, a family every member of which is useful, since they feed both in the larval and beetle states exclusively on other insects.

The field here open is a wide and inviting one, on which I trust some of you will enter. I have but touched upon it; as the results of more extended observations are recorded the opinions here expressed may need modifying. I desire to do justice to the birds.

During the month of August last it was my privilege to visit the Great

Manitoulin Island, also Sault Ste. Marie and the district adjoining. Although prevented by an accident from indulging in free locomotion, still I saw much that interested me. On Manitoulin Island I found many of the species of butterflies common in the more southern portions of Ontario; a few moths were also captured. On the shore of Elizabeth Bay, near the western extremity of the island, a full-grown larva of *Attacus luna* was picked up, and on enquiry I learned that earlier in the season that beautiful moth was quite common in that neighborhood.

In the department of Economic Entomology some items of interest were gleaned. The pea crop throughout this district is an important one, and I made a diligent search in many fields for indications of the presence of the pea bug, *Bruchus pisi*, but could find no traces of it. Satisfactory evidence was furnished me in at least two instances of the sowing of seed brought into the island which was badly infested by this weevil, yet I was assured that neither during the season following nor in subsequent seasons did the crop suffer from this pest. The pea crops growing in these particular localities were also examined by me. Hence it would appear that the climatic or other conditions prevailing in this district are so unfavorable to this destructive pest that it is unable to survive. Should this exemption prove permanent, the cultivation of the pea there will doubtless be rapidly extended, as there will be a large demand at good prices for seed peas from this section, since so many portions of the Province are now so overrun with the pea bug that it is difficult to get seed fit for sowing; and, for the same reason such seed peas will be readily purchased for planting in the Western States.

For many years the district extending from Goderich to Collingwood has, in consequence of its exemption from curculio, been extremely favorable for plum culture, and here immense quantities have been grown and shipped to other parts of Canada and the United States, Goderich being for many years an important centre for the production and shipment of this fine fruit; but within a brief period this foe has invaded Goderich in such force that to grow plums successfully there warfare must now be maintained against this pest similar to that practised in the more southern sections of the Province. This enemy has now advanced as far as Southampton, and before many years we may reasonably expect that the favored district at present exempt from Owen Sound to Collingwood will be similarly invaded. Thinking that the Manitoulin Island, from its insulated position, might possibly offer in the future a fine field for this department

of fruit industry, I examined carefully whenever opportunity offered for evidence of the presence of this insect. In the neighborhood of Manitowanning I found two trees of Lombard, a blue plum the name of which I could not ascertain, and two wild plums, all fruiting, but could find no traces of the work of the curculio; but on a farm in about the centre of the island, three miles from Gore Bay, I found on a wild plum tree which was fruiting in a farmer's garden a number of stung plums, and on opening one of them found the larva of the plum curculio nearly full grown. Since wild plums are found in many parts of the island, it is probable that the curculio will be found in other districts there. I saw several wild plum trees at the Sault Ste. Marie, but had no opportunity of examining the fruit satisfactorily; from what I saw I was led to believe that there was no curculio in that region. The cultivation of fruit both at the Manitoulin Island and at the Sault is so entirely in its infancy that it is difficult to form any decided opinion as to the probable future of this department of industry in those districts.

In many sections forest fires have destroyed a considerable proportion of the original woods, leaving many of the larger trees standing scorched and dead. From these much marketable lumber could be got were it not for the destructive work of the wood-boring beetles; these troublesome creatures have bored through the trees in every direction, and thus made the timber obtainable from them worthless for market, and useful only in the construction of barns, sheds, etc., on the property of the owners. Both of the large species of long-horned beetles, *Monohammus confusor* and *scutellatus*, appear to be abundant, the latter I think most common; some of the small wood-boring beetles belonging to the family Scolytidæ are also very numerous.

The cabbage butterfly, *Pieris rapæ*, has within the last two or three years spread over the whole of the area I visited, and is playing sad havoc with the cabbage crop. In Manitoulin Island I found a specimen or two of the Colorado potato beetle, and made further search among growing potatoes, but could find no more. I was informed that this beetle had been seen occasionally for several years past, but that it had not made any headway in any part of the island. Another insect was found attacking the potato vines, although not injuring them very much. I refer to a species of blistering beetle, *Epicauta pensylvanica?* called here the black bug. In some potato patches it was quite abundant, and the leaves were partially devoured, but nowhere did I see them in sufficient numbers to

materially injure the crop. Since the larva of this insect is found only in the nests of bees, wasps, etc., where it feeds on the young of these nest-making insects, and consumes the potato vine only while in the perfect or beetle state, no serious injury is likely to result from its presence. Its larval habits are such that if abundant one year, it is almost sure to be correspondingly scarce the following season.

In the garden of Mr. J. C. Phipps, the Indian Agent of the Government at Manitowanning, I was surprised to find that the oyster-shell bark louse, which injures apple trees, was not only abundant on the apple trees, but the stems of both black and red currant bushes were also thickly clad with them to such an extent as to have killed a number of them. I had never before seen this destructive insect attack the currant, but it has been occasionally observed on currant bushes in the United States.

For several years past I have had occasion to refer to the depredations of the forest tent caterpillar, *Clisiocampa sylvatica*, which has devastated our gardens, orchards and forests; it has now happily almost disappeared, a result brought about, I have no doubt, mainly through the agency of parasitic flies, several species of which have been preying on them extensively. In some sections of the Province the rose-bug, *Macrodactylus subspinosus*, has been abundant and injurious. In East Flamboro' I am informed that they were very destructive to the sweet cherries, devouring the fruit, and that they also injured the grape crop by eating the bunches shortly after blossoming. Some grape growers have also suffered considerably from the attacks of the grape vine flea-beetle, which devours the buds just as they are swelling in the spring.

At the late meeting of the Entomological Club of the American Association for the Advancement of Science, in Boston, our Society was represented by Mr. H. H. Lyman, of Montreal, and the Rev. C. J. S. Bethune, whose able report of the important proceedings of the Club will be read with interest. It is gratifying to learn that the good work done by the Club has given it such a standing that the Association has seen fit to establish it as a permanent Sub-section, and the more important papers read will in future be published in the yearly volume of Proceedings.

During the year the New York State Legislature has appointed J. A. Lintner, of Albany, N. Y., as State Entomologist. New York was the first State in the Union to look after the interests of agriculture in this

direction and appoint an officer for the special purpose of reporting on noxious insects. The many reports of the late Dr. Fitch, extending over a lengthened period, are well known and much valued; his successor, Mr. Lintner, is a man peculiarly fitted for the position—a most patient and accurate observer, a skilled Entomologist with an experience in this department of some thirty years, he brings to the task all the necessary qualifications. Seldom has there been an appointment so judiciously made, and I feel sure that great good will result from it.

Since I last addressed you a special Commission has been appointed by the Ontario Government to inquire into the agricultural resources of the country, and the progress and condition of agriculture therein, and recognizing the important and intimate connection of Entomology with agriculture, the Government has seen fit to appoint your presiding officer as one of the Commissioners. In performing the duties devolving upon me in this position I shall endeavor to give to Entomological matters bearing on agriculture that prominence which their importance demands.

WM. SAUNDERS.

THE HESSIAN FLY NOT IMPORTED FROM EUROPE.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The official publication of Bulletin 4, "The Hessian Fly," by Dr. A. S. Packard, for the N. A. Entom. Commission, has induced me to study again the question of the importation of this insect by Hessian troops at an early period of the war. The excellent memoir by Dr. A. Fitch was believed to have settled this question in a final manner; therefore his opinion was accepted by all subsequent American writers.

The best German monograph on the Hessian Fly was written and published twenty years ago, in Hesse, by Dr. B. Wagner. He acknowledges fully the merits of Dr. A. Fitch's monograph, but he objects to the historical part and the conclusions based upon it. As Dr. Wagner's work seemed to have settled the question so thoroughly that for twenty years no scientist in Europe has believed in the Hessian importation, I was rather astonished to find in the Bulletin a reprint of the old story, without the slightest acknowledgment of their refutation by Dr. Wagner.

I have tried myself to compare as much as possible the different publications quoted by Dr. A. Fitch, and arrived at these conclusions :

1. That it is impossible that the fly could have been imported by the Hessian troops.

2. That it is very probable that the fly was here before the war.

3. That the fly was not known to exist in Germany before 1857.

It has been entirely overlooked that Dr. A. Fitch states himself that he has been unable to fill an important *desideratum*, to make his proofs conclusive ones. He says : "We have searched in vain for the date of the embarkation of the troops or the number of days occupied by them in crossing the sea." There were indeed long before published those data, but in two works which even to-day are not to be found in any library here.* Both these works and the official manuscript report are used by Dr. Wagner. But there exist newer publications, all easily accessible here, but strangely enough, appear never to have been consulted.†

I. It is impossible that the fly could have been imported by the Hessian troops.

Dr. A. Fitch arrived, after his study of the habits of the fly, to the conclusion "that there is but one mode and but one month in the year in which this insect could probably have been conveyed to this country at that time, to wit, in straw landed upon our coast in August." (p. 29)

Everybody will agree that Dr. Fitch's reasoning is acute and to the point. As his monograph is known by every student, it is not necessary to repeat in full his conclusions (p 8–9). But he has forgotten in his calculations that the pupa state of the fly has in the summer only the duration of two months or less, and that every ship for a voyage from Europe, required on an average nearly four months ; and that straw

* The Biography of the General von Ochs, by L. von Hohenhausen, Cassel, 1827, and F. Pfister die Fahrt der ersten hessischen Heeres abtheilung von Portsmouth nach N. York : Zeitschr. der Vereins fuer hessische geschichte und Landeskunde, Tom. ii., Cassel, 1840.

† Max von Eelking: Die deutschen Huelfstruppen im Nordamerikanischen Befreiungekrisge, 1776-1783, Hannover, 1863, 2 vol.

By the same author : The biography of General Riedesel, Leipzig, 1856, 3 vol.

Friedrich Kapp : Der Soldatenhandel deutscher Fuersten nach Amerika, Berlin, 1864.

Bancroft's History, vol. viii., ix.

infested with these pupæ, to be conveyed at this time, must have been taken anterior to the harvest. Dr. Fitch tries to explain this in a queer way: "Had a company of soldiers needed straw for package, no objections would have been made to their going in a field (infested by the fly) and with a scythe gathering what they required weeks before the usual time of the harvest." Dr. Wagner is rather mortified by this funny conception of the military discipline of the Hessian troops. But the supposition is more untenable as the sending of the troops was rather unpopular; their passage was objected to by several parties, and they had to make long and various circuits, and to conduct themselves in a very cautious manner. Further, the minute official reports would have preserved details of such entirely unusual events. The first division of the Hessian troops was ready to depart in the middle of February, 1776. The troops were ordered to march from Cassel through Hanover to Bremen. As the British transport ships had not yet arrived at Bremenhaven, the troops returned to Hesse, and started again February 29th. In passing Bremen March 10th, every regiment had to be transported on seventy wagons, because the whole country was inundated by the Rivers Weser and Wumme. The small number of wagons shows that the baggage could not have been very large. The troops arrived March 21st to 22nd, at Bremenhaven, and were embarked from March 23rd to April 15th, as the transport ships arrived only slowly. The fleet started April 17th, arrived in Spithead April 28th, left May 6th, and arrived August 17th at Sandy Hook. Some ships (after Dr. Wagner's statement) seem to have reached Halifax July 7th, and Utrecht, off Long Island, August 12th. Several transport ships left Bremenhaven April 21st, and Portsmouth May 12th, but arrived at the same time with the others at Sandy Hook.

The accommodations for the troops on the ships were all furnished by England. "The bedding," says Bancroft, "was infamous scanty; their pillows 7 by 5 inches, small matrasses and woollen blankets, hardly together weighing seven pounds." Every six men slept together, in a partition 5 feet long and 6 feet broad. When the men were tired lying on one side, they had all to turn at the same time to the other side. Now if it had been possible that the bedding contained infested straw, everybody will agree that its use for three months and a half by soldiers placed so uncomfortably is more than the most persistent Hessian fly would be able to stand. The idea that camp straw had been conveyed by the

transport ships is of course impossible, when all necessary accommodations had been more than shortened.

The division was ordered, August 19th, from Staten Island to Long Island, and arrived August 22nd at Flatbush. The official records state that only the tents and the baggage were transported on very small and odd-looking wagons, each with only two small horses. Here again the supposition that camp straw had been transported is entirely improbable, the more as it is stated that "the troops found Long Island well provided with everything, even to a certain degree of comfort and luxury."

These troops left Hesse in February, and Spithead in May, also long before straw could have been made, and could not have imported the fly. *These are the very troops Dr. Asa Fitch speaks of with confidence as importers of the Hessian fly.*

The second division of the Hessian troops left Cassel in May, 1776. Bremenhaven June 3rd, arrived at Spithead June 20th, sailed together with the Waldek troops July 20th, and arrived October 21st at New Rochelle, Long Island. The date of their arrival alone proves that the importation of the fly by them was impossible.

All other German troops dispatched in 1776 were landed in Quebec. The Braunschweig troops left February 22nd, arrived at Stade March 5th and at Portsmouth March 20th. The Hanau troops left March 15th, and were embarked March 26th at Nimwegen. Both troops together sailed from Portsmouth April 7th, and arrived June 1st at Quebec. Of course its importation by these troops is out of the question.

During the year 1777 the following German troops were sent to America: From Hessen Cassel, which left March 2nd, were shipped on the Fulda May 18th, embarked May 25th at Bremenhaven, and arrived September 27th at Sandy Hook. From Hessen Hanau, which started March 7th and 31st for Dordrecht; from Braunschweig, which arrived March 12th at Stade; from Anspach Bayreuth, which left February 29th, and were embarked March 30th at Dordrecht. All left Portsmouth together April 7th, and landed June 3rd at Staten Island, and were ordered June 11th to Amboy, N. J. Comparing the dates of their arrival, an importation of the fly by those troops is impossible.

The data for the following years are without importance, as the fly appeared in fall of 1778 in New York. But it may be stated that during 1778 the troops from Hessen and Bayreuth arrived, Sept. 25th, also too late to import the fly.

All troops from 1779 to 1782 landed in Quebec or in Halifax. Only in 1780 troops embarked August 15th, arrived October 17th in New York.

I think in comparing all these data, everybody will agree that the fly could not have been imported by those troops. There has doubtless been too much patriotic impulse and indignation prevailing in accepting without any real criticism these old traditions. Patriotic motives are the worst guides in scientific questions.

II. It is very probable that the fly was here before the war.

I regret that I am not acquainted with the older American literature, and I have no means to get at it. Therefore I know only one statement, quoted by Dr. A. Fitch, which seems to Dr. Wagner and myself to prove that the Hessian fly had existed here before the arrival of the Hessian troops. The statement (I have seen the original communication) says: "A respectable and observing farmer of this town (Renselaer, N. Y.), Colonel James Brookins, has informed me that on his first hearing of the alarm on Long Island in the year 1786 (Fitch says doubtless 1776 is intended), and many years *before* its ravages were complained of in this part of the country, he detected the same insect upon examining the wheat growing in his town. These facts prove pretty satisfactorily that the Hessian fly or wheat insect is indigenous in this country."

Dr. Fitch rejects the testimony with some sarcastic phrases, and adds: "The strong probability is that it was some other insect which was found by Col. Brookins." I don't see how such testimony can be rejected. There is no need to doubt that a respectable and observing farmer would recognize the devastations done by the Hessian fly. Every one, even the most unobserving man, having seen once such a devastated field, will recognize and remember the fact. Moreover, there has not existed, nor does there exist now in the U. S., according to *Dr. Fitch's own writings*, an insect which produces similar ravages.

Dr. Fitch makes similar objections to the statement of Mr. Mitchell that the fly had appeared on Long Island in 1776, before the arrival of the troops. He says the devastations were conspicuous and liable to attract attention, and leaves us in the dark when Col. Morgan states that in 1778 the fly made its first appearance, and directly after that Mr. Clark states that the fly made its first appearance in 1779, so that at least one of them must have been mistaken.

III. The fly was not known to exist in Germany before 1857.

The fly must have existed in Europe and in Germany before it could have been imported with the troops. Dr. Fitch tries to settle this most important question by the following statements :

Mr. Duhamel, in Monceau (I have compared the original), says that "a number of white worms have been found on the wheat near Geneva, in 1755, which after a time turn to a chestnut color ; they place themselves betwixt the leaves and *gnaw the stalk ;* they are commonly found betwixt the first joint and the root ; these animals appeared about the *middle of May.*"

It is rather strange that just this passage has been quoted and always reprinted. Mr. Duhamel says plainly, "the larva gnaws the stalk." Now Dr. A. Fitch says (p. 33), "the larva of the Hessian fly lives upon the sap ; *it does not gnaw the stalk.*" And Dr. Packard says (p. 15), "their soft and fleshy undeveloped mouth parts *do not enable them to gnaw* the surface of the plant."

The fact that the stalk was gnawed shows evidently that the insect was not the Hessian fly, but a species of *Oscinis ;* the larvæ of some species of which would gnaw the stalk—or perhaps *Opomyza florum.* The pupa of those species is also brown and appears above the root between the leaves and the stalk, and the imago appears just as Duhamel states, in *the middle of May,* one month later than the Hessian fly. Prof. J. Kuehne remarks that the effects produced upon the plants by *Opomyza* are similar to those of the Hessian fly.

Therefore the quotation of Duhamel is entirely out of place, and this is, by the way, *the only one* by which the existence of the fly in Europe before the war has been corroborated. I have gone through the literature from 1770 to 1804, without finding any statement of similar devastations of wheat, for Germany, for France and for Spain. There exist a number of books where such a calamity in France would have been noted if it had existed.

I have not been able to consult the long and detailed report of Sir Joseph Banks to the British Government. An extract given by Kirby and Spence shows that the fly did not exist in England in 1788, and that no where on the continent its existence or similar devastations were known.

In 1834, Prof. Kollar, of Vienna, in his treatise on injurious insects, published an account on some devastations done by the Hessian fly—he has first in Europe used this name for a European species—in Altenburg,

Hungary, and in Weikendorff, 17 miles from Pressburg, an estate belonging to the Prince of Sachsen-Coburg. Dr. A. Fitch quotes both as "Saxe Altenburg and Saxe Coburg, about a hundred miles distant from Hesse Cassel." "It is a strange geographical mistake," says Dr. Th. W. Harris (Corresp. p. 189), "to transport those localities to Saxe, whereof Altenburg is 400 miles distant, and Weikendorff near the border of Hungary, about 375 miles distant." Nevertheless Dr. Packard reprints again the strange mistake made by Dr. A. Fitch, as *the only proof for the existence* of the insect in a district not far distant from Cassel.

The careful study of Prof. Kollar's report makes it very doubtful if his insect is the Hessian fly. He describes the larva as pale green with a small black dot above, which does not at all agree with the Hessian fly, but very well with the larva of a Chlorops. He states having reared *but one fly*, but he describes *both sexes*. His description is simply a translation of those of Th. Say, and not a correct one, as he translates several times fulvous for golden.

I have never seen the dissertation on the same calamity by Dr. Hammerschmidt, Vienna. It is printed in a small number for private circulation. Prof. J. C. Westwood having received specimens of the pupa in the straw, doubts if it is the Hessian fly. Perhaps the strictures on his report by Dr. A. Fitch (p. 8) are correct, as they have never been refuted by Prof. Westwood. But it is to be remarked that *C. destructor* is not the only species of the genus having a coarctate pupa. Dr. Fitch (p. 40) has detected one on *Agrostis lateriflora*, and Mr. Winnertz states the same for *C. graminicola* from Europe.

All European works on the Hessian fly, published after 1857, agree that it was then an entirely new pest, never seen before and unknown to all prominent Dipterologists—Wiedemann, Meigen, Zetterstedt, Loew, Bremi, all monographers of this genus, and Schiner. The species was represented in no collection, and apparently not in the Vienna Museum, as Mr. Schiner, 1864, quotes as localities for Europe only those given by Mr. Dana. Nevertheless I am obliged to state that 30 years later, after Mr. Haberlandt, the Hessian fly, *C. secalina*, has been observed in the same parts of Hungary.

The only sure statement of the existence of the Hessian fly in Europe is its discovery by Mr. J. Dana in 1834, at Mahon, Toulon and Naples. The identity of this insect with the American species is to be accepted on Th. W. Harris's authority. There was never a better authority, and

scarcely one who has better known the insect. He has given his conviction of their identity in the most unequivocal terms. The statement that the insect had been in Minorca from time immemorial, and often done great damage both there and in Spain, is very interesting, but not to be accepted as certain before having been corroborated by reliable reports. I am not able to compare the old Spanish literature, but I think it should be done.

The existence of the fly in Asia Minor, near the shore, is probable from the discovery made by Prof. Loew of the larva and pupa on the straw in 1842, and later recognized by him as identical with his *C secalina*.

Mr. V. von Motschulsky describes in 1852 a fly very obnoxious to the wheat in the governments of Saraton and Simbirek, in Rusland, as *C. funesta*, together with its parasites. I may add that von Motschulsky, after his return from America, and having received typical specimens of the Hessian fly and its parasites from Dr. A. Fitch, has assured me that *C. funesta* and *C. destructor* are the same species. This is also accepted in von Osten-Sacken's catalogue. Mr. Koeppen, in his excellent work just published "On Injurious Insects in Rusland," states that since that time nothing has been known about the fly in those parts of Rusland. "Before 1879," says Koeppen, "we had no reliable report about the existence of the Hessian fly in Rusland, which was discovered in Poltowa and Sula by Mr. Lindemann in the summer of 1879, together with its parasites."

In 1857 and 1858 the rye was extensively damaged in Silesia, Posen and Prussia. Prof. Loew, at the time the leading Dipterologist studied the insect, and declared it to be very similar to the Hessian fly, but probably a new species named by him *C. secalina*. He had never seen the American species, and had to rely on Dr. A. Fitch's description, which did not fully agree with *C. secalina*. In 1859 the same insect was very obnoxious to the rye in Eastern Prussia, and was studied by myself. In 1860 it had advanced westward to Augusburg, where it was studied by Prof. Rosenhauer, and to Fulda, Hesse. Everywhere it was considered to be an entirely new pest, never seen or observed before. In Hesse the fly was studied by Dr. B. Wagner, and his monograph is perhaps the most satisfactory existing in Germany, though it seems to be entirely unknown here. The fly destroyed in Hesse wheat, rye and barley. I am not able to say whether the insect did advance farther west. In the following years the calamity subsided, and was soon nearly forgotten. Extensive destructions in Hungary in 1864 are reported by Mr. Haberlandt and Kuenstler,

and in 1879 in Rusland. I find no statements of injury done by the fly in Germany after 1860, and the reports for Bohemia for 1872 and 1879 state directly that the fly was not observed. Dr. Schiner, in Vienna, had till 1864 seen no specimen ; the best proof that it had not been obnoxious in Austria.

Dr. Wagner was the first to acknowledge the identity of *C. cerealina* and the Hessian fly. In observing the manner of life and the time of swarming of the fly in Hesse, and comparing both with the time of the departure and the arrival of the Hessian troops, Dr. Wagner comes to the conclusion that the importation of the fly by those troops is strictly impossible.

If we consider the positive evidence of the existence of the Hessian fly in Europe, we find that between 1830 and 1840 it occurred in four localities on the northern shore of the Mediterranean. It appeared in 1850 more to the north in southern Rusland, and advanced strictly westward through Germany till 1860 as a very obnoxious pest. After all I think it would be hardly more difficult to accept and to prove that the fly was introduced by the energetic trade with the Mediterranean from America, and became obnoxious only after acclimatisation, as to accept the introduction into America from Europe. It is difficult to suppose that the fly had been overlooked by such a number of prominent Entomologists as those named. Dr. Wagner accepts as a fact that the fly was imported from Asia to Europe and from Europe to America. The same supposition was made long ago by T. W. Harris, because the fly is connected with the cereal grasses, and therefore their original home was presumed to be the same with those plants. Against this conclusion I have to make two objections. First, the fatherland of these plants is unknown. That they live still wild in Persia, as Dr. Wagner supposes, is not proved at all. Buffon also remarks that our cereals are not known to grow wild anywhere, and later statements have always been proved to be unfounded. The fly is not found till now in the Orient. Second, *it is not true* that such an obnoxious insect is strictly limited to some few species of plants. The potato bug has given abundant evidence that an insect not obnoxious before may become so by finding a related plant better suited to its taste. Dr. A. Fitch (Rep. II., p. 297) well says, in speaking of some wheat and barley flies, "As these flies appear to be native species, it is probable that before wheat was cultivated upon this continent they sustained themselves upon some of our wild grasses. Their numbers

must therefore have been very limited at that period. But when wheat was introduced and became extensively cultivated, it gave them such an ample supply of most palatable nourishment that they have gradually increased, and are now excessively numerous, laying every wheat field under contribution for their support." Is it not obvious that the same course may have happened with the Hessian fly? The more so since just at the time of its appearance in Long Island and the adjoining country, the culture of wheat was prominently advanced. Since we know that at the utmost during six weeks in the year only is the importation of the fly possible, such an importation to America before the discovery of steamships is almost inconceivable. Even if purposely undertaken with all care such an importation would almost surely have been a failure.

Dr. Wagner has felt the strength of those arguments, and supposes that importation had been possible only from the nearest coast of France. He believes that the lesser distance, as well as the frequent trade with France, makes it more probable. But why not accept that the fly was indigenous here as well as in the old world? There are Diptera identical with European species, which nobody would think to have been imported. I may mention the common *Trichocera regelationis*, which belongs to a related group. The species is common here, and was observed by me 13 years ago. But last winter I had specimens sent me from Maine, stating that this insect had never been seen there before, and had been extremely troublesome. I know well that many animals—higher and lower ones—have been imported, because the facts are well recorded; I believe that a number of others have also been imported, for which the facts are not recorded. But I see no reason to go farther, and am prepared to accept that the same species in both countries may have been developed under similar conditions. I consider, therefore, the Hessian fly to be an indigenous American insect, and not imported by Hessian troops.

A few words more concerning the periods of unusual abundance of the fly. I was very much interested in the study of the table given by Dr. Packard, but I arrived at the conclusion that the table is not sufficient, and indeed is considered by Dr. Packard himself as very imperfect. Concerning N. England Dr. A. Fitch's statement has been overlooked, Regs. viii., p. 203, that the fly was very injurious in Bercks Co., Mass., in 1779.

The year 1823 for Maine, and 1857 for Ohio, are not marked at all in the table, and both the records state that the farmers had ventilated

earnestly the question to give up entirely the cultivation of wheat. The only conclusion to be made by the table would be that with an intermission of 30 to 40 years, a period of superabundance follows. Perhaps a careful study of the old records from 1748 to 1750 would give some evidence, if the fly has ever been obnoxious here before the war. It is a curious fact that such an intermission of the appearance of the Hessian fly has occurred just in that quarter of the century, during which the most ardent collector and student of the N. American Diptera—I may say the founder of the American Dipterology—was here. In fact, Baron Von Osten Sacken has never met here with this Hessian fly, which is not represented in his collection nor in Prof. Loew's, both now in the Museum in Cambridge.

NOTE.—As the paper was going through the press, I received two pairs of *C. destructor* from Prof. J. A. Cook, the first American specimens which have come to my hands. In comparing these with two pairs of *C. secalina* from Prussia and Hesse, I was astonished to find the American insects twice as large as the European ones, and almost entirely black. I think they look so different that the identity is perhaps not sure. But a larger series from both countries and a more detailed knowledge of Diptera than are at my command, would be needed to decide the question.

TWO NEW SPECIES OF EUPELMUS, WITH REMARKS UPON E. (ANTIGASTER) MIRABILIS, WALSH.

BY L. O. HOWARD, WASHINGTON.

EUPELMUS REDUVII n. sp.—*Female.*—Average length of body 2.4 mm. Average wing expanse 4.6 mm. Head slightly wider than thorax, which is of equal width with abdomen. Antennæ sub-clavate, as long as thorax. Collar rather long, much narrowed in front and concave above. Anterior half of mesothoracic scutum convex; a broad, longitudinal depression posteriorly, the anterior corners of which are extended on in the parapsidal furrows. Scutellum small, much narrowed in front. Abdomen somewhat concave above, keeled below. Middle tibial spine stout, but not quite so long as first tarsal joint, which is much widened and has a double row of serrations on its inner edge; second tarsal joint also

widened and doubly serrate, but not nearly so much so as the first. Head densely punctured. Scutum apparently smooth, in reality very slightly punctured. Scutellum more coarsely punctured than the head. Abdomen smooth. Color: Head dark metallic green; eyes dark brown; antennal scape light yellow brown, flagellum black with extremely short whitish pile; scutum dull metallic green, appearing coppery brown in most lights: scutellum brilliant light metallic green; sides of the mesopectus yellowish; front legs yellowish brown, darker along the upper side, tarsal claw dark brown; middle legs the same, spine light yellow-brown, serrated edge of first two tarsal joints nearly black; hind legs all dark brown, lighter underneath. Front wing with a quite well-defined, dusky, transverse band, at the point where the sub-costal vein reaches the costa, and with another transverse band at the point where the stigma is given off, with its proximal border convex and well-defined, and its distal border shading gradually to a hyaline wing tip. Sub-costal vein reaches costa at one-third the wing length, and the stigma is given off at two-thirds.

Male.—Average length 1.5 mm. Average wing expanse 3 mm. Head of same width as thorax and much wider than abdomen. Antennæ rather slender, sub-cylindrical, attenuated at tips, somewhat hairy, as long as thorax. Collar normal. Parapsides of scutum distinctly separated. Scutellum so narrowed in front as to be pointed. Middle tibial spur nearly as long as first tarsal joint. Sub-costal vein reaches costa at two-fifths the wing length and gives off stigma at three-fifths. Head with delicate transversely elongate punctures. Thorax with a delicate hexagonal sculpture and sparsely scattered pits, from each of which arises a short hair. Abdomen smooth. Color: Eyes and antennæ dark brown; head, prothorax and mesothoracic scutum dark metallic green; the rest of the thorax coppery brown; abdomen dark brown, nearly black, front legs uniform light yellow, except tarsal claw, which is brown; middle femora yellowish with a brown stripe along upper edge, tibiæ yellow with a brown annulation at distal end, spine yellow, first and second tarsal joints yellow, all others brown; hind femora brown, proximal half of tibiæ yellow, the remainder dark brown; all coxæ yellow; wings clear, subcostal nerve and stigma light brown.

Described from 3 ♂'s, 4 ♀'s, reared from the eggs of *Reduvius novenarius*.

EUPELMUS FLORIDANUS n. sp.—*Male.*—Length of body 2.1 mm. Wing expanse 3.1 mm. Body rather slender. Head large, slightly wider than thorax. Thorax and abdomen long and narrow; abdomen tapering from fifth segment to base. Antennæ thick, cylindrical, somewhat shorter than thorax. Collar short. Scutum large and prominent; parapsidal furrows obliterated. Face finely impressed with transversely elongate punctures; top of head rather coarsely punctured; thorax as with ♂ *E. reduvii;* abdomen smooth. Color: Head and thorax metallic green, appearing golden or coppery in different lights; eyes reddish brown; antennæ and abdomen dark brown, nearly black; front femora very light yellow, tibiæ light yellow with a brown patch above, tarsi fuscous, the last joint darker than the others; middle femora light yellow with a slight fuscous patch above, tibiæ dark brown, yellow at either end, tibial spine whitish, first three tarsal joints whitish, last two dark brown; posterior femora light yellow with a very broad dark brown annulation in the centre, femero-tibial joint brown, tibiæ dark brown with a light yellow distal end, tarsi whitish except last two joints, which are dark brown; all coxæ yellow, stigma and subcostal vein light brown.

Described from one ♂ specimen bred from an unknown Tineid larva on orange, taken at Jacksonville, Fla., by Prof. Comstock.

EUPELMUS (ANTIGASTER) MIRABILIS, Walsh.—The rearing of a number of specimens of this interesting Chalcid from eggs of *Microcentrum retinervis* collected by Prof. Comstock at Jacksonville, Fla., has given me an opportunity to verify a suspicion which I have for some time entertained, namely, that there were no grounds for the founding of the genus *Antigaster.* A comparison of the specimens with Walsh's description shows the latter to be an excellent one; but there is not a single structural character mentioned by him as belonging to this "anomalous" genus, but what belongs equally well to the old genus *Eupelmus* Dalm. As to the habit of elevating its abdomen which Walsh considered so particularly anomalous, it is such a well-known thing to European writers that its seeming absence in *E. Geeri* caused Ratzburg a momentary doubt as to this species being a *Eupelmus* (see Ichn. d. Forstins, iii., p. 199). In the allied genus *Eusandalum* Ratz., and possibly in other Eupelmide genera, the same thing is seen, but in a slighter degree. Prof. Riley seems to have suspected this when he says: (6th Mo. Rep., p. 162) "No other species is so curiously constructed for rolling backward into a perfect

ball, unless it be some belonging to the very closely allied genus *Eupelmus*."

I happened to observe the process of copulation with *E. mirabilis*, which took place in the following way: The males issued a day or two before the females. The first morning that a female made her appearance I happened to be watching the breeding jar. Presently one of the males ran up to her and began stroking her antennæ, the antennae of the male opening and shutting laterally, while those of the female made the usual up and down motion. After this had continued for some minutes, the male ran around her and took an erect position at the posterior end of her body, so that the two insects were at nearly right angles to each other, the male being supported by his middle and hind legs, and the end of his abdomen being closely applied to that of the female. Coitus lasted 30 secs., when the male withdrew his bilobed penis, and, curiously enough, ran forward upon the thorax of the female and seemingly clawed her violently with all of his feet. He then jumped down and ran away. I saw the operation upon one other occasion, when it was performed in a precisely similar manner.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting of the above Society was held, according to announcement, in the City of Hamilton, on the evening of Tuesday, the 28th of September, in the City Hall. A number of those especially interested in Entomology in various parts of the Province were present.

The report of the Council was read and adopted; also that of the Secretary-Treasurer, which showed a satisfactory state of the finances. The President then delivered his annual address,* for which he received the thanks of the members present.

The election of officers was then proceeded with, which resulted as follows:—

President—Wm. Saunders, London.

Vice-President—Rev. C. J. S. Bethune, M. A., Port Hope.

* See page 189 in present number.

Secretary-Treasurer—E. B. Reed, London.

Librarian—W. E. Saunders, London.

Council—J. A. Moffat, Hamilton; James Fletcher, Ottawa; R. V. Rogers, Kingston; G. J. Bowles, Montreal; J. M. Denton, London; W. H. Harrington, Ottawa, and Wm. Couper, Montreal.

Editor—Wm. Saunders.

Editing Committee—Rev. C. J. S. Bethune, E. B. Reed, J. M. Denton.

Auditors—Chas. Chapman, A. Puddicombe.

After the routine business was concluded, Mr. Bethune offered some remarks on the moth of the cotton worm, *Aletia argillacea*. Twelve years ago he found it extremely abundant late in the season on ripe plums; he had not taken the insect again until this autumn, when they were found to be quite common in his garden. The opinion which had been advanced by Prof. Riley, of Washington, that the examples of the moth taken in these northern sections had flown northward from their breeding places in the south, he did not concur in, but believed that the insect must feed on some malvaceous plant in our midst, since the specimens he had captured were very perfect and looked as if they had just escaped from the chrysalis. He referred to the fact of this insect having been found common in many of the Northern States, as well as in Canada.

Mr. Reed stated that he had taken this insect also in London.

Mr. Moffatt exhibited a number of interesting insects which had been captured by him at Long Point and at Ridgeway, among others *Papilio cresphontes*, *P. marcellus*, *P. philenor*, *Darapsa versicolor* and *Junonia cœnia*.

Mr. Denton reported the capture of *J. cœnia* and *Libythea Bachmani* at Port Stanley; also of *Thyreus Abbotii* at London.

Mr. Moffat stated that this beautiful Sphinx, *T. Abbotii*, had been comparatively common in Hamilton, and that a number of the larvæ had been reared.

Mr. Fletcher reported having captured two specimens of *Erebus odora* at Ottawa, one of them so perfect that he thought it was impossible that it could have flown for any distance, and thinks it must have bred in the neighborhood.

Mr. Saunders referred to several other instances of the capture of this rare moth in Canada during the past few years.

Mr. Fletcher referred to the fact that during the last year there were published a number of papers on popular Entomology, and he hoped to

see them continued, as he believed they were doing good service in making our valuable monthly journal more popular. Several of the members present promised to prepare papers of this character during the coming year.

Mr. Young, of Hamilton, asked for information on the best manner of preserving caterpillars, and enquired if any of the members had any experience in blowing them.

Mr. Reed stated that he had tried and failed. Mr. Fletcher had the same experience to relate, and had found that the only satisfactory method was to draw and color them from nature.

Mr. Fletcher thought that most of our collections were deficient in specimens illustrating nature; that while we had spread specimens, we should also have them as at rest, and where possible, the larvæ, chrysalids and eggs.

Mr. Reed asked in reference to *Anisota rubicunda*, which he had found common on maple about London, but very hard to rear; he wished to know the experience of other collectors. Several of the members present stated that they also had found it difficult to rear them.

Mr. Young had reared a brood of them from butternut and beech, and found them to prefer beech to any other food. Mr. Bethune had also found them on beech trees.

Mr. Fletcher had found a small fly attacking beans this year; the larva had eaten the stem of the bean and bored into the root, and finally produced a small fly somewhat resembling a house fly.

Mr. Saunders had found several years ago a very similar fly, probably the same species, attacking the stems and roots of young cabbage plants. On comparing the fly with the description given in Curtis' Farm Insects of the root-eating fly, *Anthomyia radicum*, often so troublesome in Europe, he thought it probable that it was the same species. Mr. S. also reported the capture of *P. cresphontes* very early in spring, finding the larva nearly full grown in June, which became a chrysalis, and from which the perfect insect escaped in about a fortnight. He had also taken the full-grown larva late in the fall, which had passed the winter in the chrysalis state, from which facts he drew the inference that this species is double-brooded in Canada.

Mr. Fletcher reported having found the larva of *Ceratomia quadricornis* about Ottawa, and finds it a difficult insect to rear.

Mr. Young had fed a brood of the larvæ of *Telea polyphemus* on black birch, on which they seemed to thrive remarkably well.

Mr. Kyle, of Dundas, stated that he had found *polyphemus* feeding on witch hazel *(Hamamelis virginica)*, and *promethea* feeding on ash and lilac.

Mr. Moffat had found *promethea* also on wild cherry, as well as on ash, sassafras and lilac.

NEW SPECIES OF N. AM. MOTHS.

BY A. R. GROTE.

Trochilium lustrans, n. s.

Larger than *tipuliformis*, with long black antennae, which are whitish before the tips. Abdomen black with six yellow bands, the two terminal ones broader than the rest and continued beneath. Anal tuft black and yellow. Legs yellow, marked on tibiae and femora with black. Thorax black with yellow inner edge to the tegulae. Head black with a yellow ring behind and yellowish stripe on each side of the clypeus. Palpi yellow. Thorax yellowish beneath. Wings pellucid; primaries with black bar and black fringes and terminal border; beneath the costa of primaries to the transverse bar is yellow; costa of secondaries yellow. *Expanse* 23 mil. Length of body 12 mil. Dayton, O., Mr. G. R. Pilate. Seems to differ from any of the yellow and black species by the white portion of the antennae.

Euhalisidota longa, n. s.

♂ ♀. Size of *E. fasciata* from Cuba, but without the band on ♂ secondaries. Differs from *luxa* by its slighter build, undotted thorax, a dark streak on primaries at extremity of median vein following along vein 5. Yellowish clay color, somewhat dusky about thorax and head. Fore tibiae orange shaded inwardly. Fore wings irrorate with brown speckles. A subterminal row of interspaceal brown dots preceded on the interspace above vein 5 by a brown mark. Vein 5 at base shaded with purply brown. Hind wings immaculate; a brown dot at apices beneath. Length of primary 25 mil. Enterprise, Fla., Mr. Schwarz; Fla., Mr. Drury. I have alluded to this species in Can. Ent. as allied to the forms described by me in 1865 from Cuba.

Mamestra acutipennis, n. s.

This is a species with rather long wings, having the external margin quite oblique. It is nearer, perhaps, to *vicina* than any other species. The wings are blackish gray and with the median space shaded with black. The markings and lines are inconspicuous. The median lines approach on submedian fold. The orbicular is ovate, oblique, paler gray, with black central streak. Reniform similar, upright, rather narrow and small. Subterminal line pale, with a projection over m. nervules, without teeth; it forms the usual more prominent white mark relieved by black scales above internal angle. Secondaries diaphanous white at base with discal point and broad diffuse blackish borders. Thorax blackish. A black line on collar. Beneath the hind wings are whitish at base, powdered with blackish exteriorly, with a discal dot and mesial line. *Exp.* 30 mil. Nevada, Dr. Bailey.

Hadena cylindrica, n. s.

A small bodied and rather large winged species of a dusty gray, with obliterate lines. The orbicular pale gray, rather large, slightly oblique. The reniform large, blackish gray, with blackish centre, relieved by blackish shading. Subterminal line pale, indeterminate, straighter than usual, preceded by a brownish shading over the median nervules. Veins marked in blackish, dotted with white in place of posterior line or behind it. A fine, black, interrupted terminal line. Fringes gray, narrowly cut with paler, and finely interlined. Hind wings yellowish gray, unicolorous, paler beneath, from whence they reflect a mesial line and dot. Fringes whitish; beneath preceded by a black broken line. On primaries above the s. t. line issues from an ill-defined pale apical shading. Thorax like fore wings; abdomen colored like hind wings. Eyes naked. Abdomen without tufts except at base. Tibiæ unarmed. *Expanse* 25 mil. Nevada, Dr. Bailey.

Hadena tonsa, n. s.

A small blackish gray species resembling somewhat the *vicina* group of *Mamestra*, but with naked eyes, and with the subterminal line forming three curves, the widest over the median nervules at the place of the usual W-mark, which latter is usually more prominent in *Mamestra* than in *Hadena*. The median lines uneven, propinquitous, narrowing the median space, especially inferiorly, and shaded with black from the diffuse median shade. Reniform well-sized with double black annulus enclosing a white

ring; the centre gray, or whitish with a mixture of blackish scales. Orbicular well-sized, ovate, a little oblique, colored like the reniform. The narrow terminal space blackish gray. Edge of the wing with an uneven black shaded line. Hind wings fuscous, without markings, with pale interlined fringes. Head and thorax blackish gray; collar with black line. Abdomen with moderate mesial tufts. Beneath the wings are blackish fuscous, with a dot on secondaries and obsolete lines. *Exp.* 22 mil. Nevada, Dr. Bailey.

Hadena (Pseudanarta) crocea Hy. Edw.

This form only differs from the typical *flava* from British Columbia by the primaries above being shaded with pale, especially on the disc, and being more yellowish beneath at base, contrasting with the black border. These colorational characters do not seem to be constant, for in one specimen from Oregon the pale shading is confined to a space about the reniform, and in a still paler *crocea* from Colorado the contrast between the yellow base and the black terminal band is not as great as usual. I think *crocea* is a variety of *flava*. In both the exterior line is outwardly bent over the median nervules and followed by a whitish and then a brown shade.

Hadena (Pseudanarta) singula, n. s.

♂. The primaries have the exterior line not so roundedly exserted over the median nervules and not followed by a white or brown shade. It forms a short tooth opposite the cell. The double black dash on s. t. line opposite the cell is distinct and long. Beneath as in *flavidens*, but differing from this in the wider median space and the prominent flexures of the anterior line inferiorly. The terminal black band on the yellow secondaries above wider than in the other forms. Collected by Belfrage in Texas and considered a variety of *flava* by Mr. Morrison.

Perigea falsa, n. s.

♂ ♀. Eyes naked; tibiæ unarmed. Color and appearance of *Mamestra arietis* or *pallilis*, but a little more dusky and yellowish. The color is gray with a mixture of yellowish and fuscous scales. All the markings and lines broken. Stigmata concolorous, with broken black annuli, large, inconspicuous. Posterior line a succession of white venular dots more or less evident, preceded by black dots persistent. Subterminal line uneven, indicated by the difference between the fuscous shaded s. t.

space and the paler yellowish gray terminal space. A broken black terminal line; fringes yellowish gray. Hind wings fuscous in female and with whitish bases in the male. Varies in the amount of fuscous shadings on the primaries. Head and thorax yellowish fuscous. Beneath the wings are light fuscous with faint double lines and spot on secondaries. *Exp.* 28 mil. Havilah, Calif., Mr. Hy. Edwards, No. 6888.

Perigea albolabes, n. s.

Fore wings uniform glistening blackish fuscous with all the lines obsolete except the subterminal, which is represented by a row of white dots, relieved by black scales. The seven white dots on the costa evident. A white spot in the place of the reniform on median vein. The fuscous fringes interrupted with dots alternating with the spots of the subterminal line. Hind wings fuscous with soiled veins and paler bases. Beneath the narrow terminal spaces on both wings gray, lighter and contrasting. On hind wings double lines, the inner dentate, a discal spot. Fore wings with double lines, the outer formed by contrast of color with the pale terminal space; no discal spot. Thorax concolorous with primaries. The reniform above the white spot on fore wings can be faintly perceived marked by detached black and white marks. *Expanse* 34 mil. Prescott, Arizona, Mr. Hy. Edwards.

Lithophane contenta, n. s.

♂. Antennæ more lengthily bi-ciliate than in the other species. Very different from the two previously described Californian species, *oregonensis*, which is like *georgii*, and *carbonaria*, a decidedly aberrant form, both of which I have seen in Mr. Hy. Edwards' collection. The new form is narrow-winged, soiled gray, and resembles *petulca* in its ornamentation, but without the brown colors. All the lines obliterate; the anterior indicated by dots and streaks, strongly dentate. The reniform can be made out, with a brown tinge. The subterminal line shows two black preceding luneiform marks opposite the cell. Hind wings translucent fuscous; beneath with discal dot and extra mesial line indented opposite the cell. The wings are reddish gray below, slightly irrorate with fuscous, faintly colored; the primaries with discal dot and fuscous from the base to s. t. line. Collar brownish with marginal black line; thorax like fore wings. The median shade, angulated on disc, is noticeable on the primaries, on which all the lines and markings are broken and dotted. *Exp.* 38 mil. Calif., No. 4588, Mr. Hy. Edwards.

Cleophana antipoda.

This species has the discal marks evident. It is allied to *eulepis*, but decidedly distinct, having more of the appearance of a *Cucullia*. Fore legs with a tibial claw. Collar with a mesial projection. Fore wings whitish gray with all the lines broken into blackish streaks and points. Hind wings pellucid white with soiled edges and veins. Abdomen with reduced tufts on basal segments. Colorado, Mr. Neumoegen. This species, which looks like *Cucullia asteroides*, but without the brown tintings, expands nearly 40 mil., and is, I am informed, the *Cucullia antipoda* of Mr. Strecker.

Mr. Strecker's generic determinations are based throughout on superficial resemblances. No structural details are given except in the case of a genus which he bases on a "very large number" of costal nervules. As the number of these nervules is invariable, never being more than three subcostal and three costal, the value of such an observation is apparent. Not content with establishing species and genera without ever having any experience with structure, Mr. Strecker also makes a disproportionate number of synonyms, not only of small or inconspicuous species, but large and easily known ones, such as *Catocala illecta* and *Smerinthus occidentalis*. Add to this that his publications have been proven to be incorrectly dated, and enough has been shown to justify their neglect at the hands of all right thinking students in the country. In the Noctuidæ I adopt his names where I can find them, but his descriptions are too indefinite to be used where they are not accompanied by figures.

Nolaphana labecula, n. s.

This species, of which I have only females from Wisconsin and New York, is quickly to be separated from *Zelleri* and *malana* by the round orbicular being yellowish white, and the disc beyond it and the place of the reniform are shaded with this same color. The most prominent line is the median shade, which crosses the wing obliquely over the yellowish white shading on the cell and there joins a black streak over vein 5 at base, lined above with pale. The anterior line is roundedly exserted superiorly and not indented here as in its allies. The posterior line is denticulate superiorly where it is even in *Zelleri*, but this line is otherwise much as in *Zelleri*, and not with the prominent indentations of *malana*. In color the new species is more bluish gray, lighter, not so fuscous tinted

as its allies. Beneath it is light yellowish gray with the spots and lines much as in *Zelleri*, which it exceeds in expanse. *Expanse* 22 mil. Erie Co., N. Y. (coll. m.)

Phoxopteris loricana, n. s.

Bronzy brown with metallic reflection. Fore wings produced at apices; a metallic patch, widening outwardly, triangulate, extending to middle of wing, limited inferiorly by the submedian fold. A metallic stripe along internal margin. Costa from middle to apices shaded with ochre brown, enclosing black marks on the edge of the wing and some metallic scales just beyond middle of wing; beyond this is a curved line of black and metallic scales just before apices, and within it some metallic scales on costa. A sinuate black line, becoming metallic at base of fringes, runs down from apices, bounding the ochre brown portion of the wing and limiting outwardly a patch extending above internal angle to middle of external margin. This patch is outwardly ochre brown, enclosing an inferior black dash and above a dead brown ovate spot. Inwardly the patch is metallic, enclosing a black spot and an irregular black line, partially resolved into dashes. Hind wings dark brown with paler fringes. Head and thorax metallic. Beneath iridescent black with ochrey tips to fore wings. *Expanse* 18 mil. Collected by Mr. G. R. Pilate at Dayton, Ohio. Type in collection of Prof. Fernald, who kindly informs me the species is hitherto unnamed.

Racheospila cupedinaria, n. s.

♂. Antennæ with long pectinations, but simple at tips for over one-fourth of their length. Size small. Fore wings delicate green, with the lines obliterate. Red discal points on both wings. Wings margined with dark red and with paler red fringes. Costa of primaries margined with red above and below. On external margin the red edging broadens at internal angle. Internal margin of primaries and costal margin of hind wings without edging. On secondaries the red edging is continued around anal angle, where it widens slightly, as also below apical angle; beneath as above, the discal points feebly marked. Stem of antennæ white above and between them on vertex. Head behind collar and front red. Abdomen red, with white spots on dorsum, the largest near the base; beneath paler. Thorax red centrally with a white spot behind; tegulæ green. Length of primary 7 m.m. Florida (Enterprise, May 24), Mr. Schwarz. Differs from *miccularia* by the red abdomen and absence of white lining

to the marginal band; from *lixaria* by smaller size and want of median line, and by having the fringe not spotted with white.

Drepanodes Fernaldi Grote, C. E., x., 17.

I find that this is the same as *Lozogramma atropunctata* Pack., and that I was wrong in referring the moth to *Drepanodes*.

Polia theodori.

Apatela theodori Grote, Can. Ent., x., 237.

This species is of large size and showily stained with pale red. It is grayish white and in its ornamentation closely follows *Polia aedon* Grote and *P. epichysis*. The three forms are related; the subterminal line is acutely dentate and very obvious, and there is a guttate mesial line on the secondaries. *Aedon* is gray, *theodori* pale red over whitish, *epichysis* is purplish and darker than the others. All three forms are Western and may form a distinct group when both sexes can be thoroughly examined.

Polia epichysis, n. s.

In color and appearance the species copies *Lithophane thaxteri*. Purple gray; markings distinct. Reniform diffuse, reddish, vague. Orbicular moderate, round, reddish, faintly-ringed. Anterior line outwardly oblique, black, uneven, inflected on vein 1. Half-line marked. Median shade marked on costa. Posterior line dentate, well removed outwardly. Subterminal space paler. S. t. line acutely dentate, followed by blackish shading. Secondaries pale ruddy fuscous. A mesial dotted line and faint discal lunule repeated beneath, where there is a basal ray. Beneath pale, with a ruddy tinge. Thorax purple gray. One fresh specimen, Mr. Behrens, Shasta, Soda Springs.

This species expands 48 mil.; in ornamentation it closely resembles *theodori*, while very different in color.

Chytolita petrealis, n. s.

♂ ♀. This species has the same ornamentation as *C. morbidalis*, but is darker colored and very much smaller. Dusky olivaceous. Subterminal line guttiform, usually followed by pale points. Median lines a little uneven. Reniform darker than the wing, more or less completely filled in; in one specimen, a variety, black and contrasting. A terminal broken line. Fringes concolorous. Hind wings paler with an uneven oblique exterior line more or less accentuated, followed by pale shading

and more apparent inferiorly where it is bent before anal angle; the interior line more or less marked. The male palpi seem proportionally longer and held more horizontally than in *morbidalis*. *Expanse* 17 mil. Ohio, Illinois, four examples taken in June and July. In this species the fore legs have the usual pale tuft of hair.

Salia interpuncta Grote.

This species has a wide range. I have it from Florida (Mr. Schwarz) and Mass. (Mr. Goodell). Prof. Zeller had it from Texas; I have taken it originally in Alabama. It is a pretty species.

Biston virginarius, n. s.

♀. Cinereous; white speckled over black. Lines thick, black, continuous. Anterior line upright, flexed below median vein. Median shade as broad as the lines, upright, flexed below median vein, where it runs near to the outer line; this latter is much inwardly bent below median vein, and is less oblique and further from the outer margin than usual. A curved line marks the outer discal spot on the cell and a black dot the inner discal spot between the median shade and the anterior line. Subterminal line thick, black, jagged, followed by a white shading. Fringes black, interrupted with white. Veins marked with black. Beneath four equidistant black spots on costa mark the inception of the transverse lines. Secondaries with discal mark and double mesial black lines. Size of *ursarius*, with the wings less translucent, the markings more distinct, the outer line more bent. Shasta, Soda Springs, July, Mr. Behrens.

OBITUARY.

Professor Samuel Stehman Haldeman, of the University of Pennsylvania, a distinguished naturalist and philologist, and at one time President of the American Philological Association, died on Tuesday evening, September 10th, at his residence in Chickis, near Columbia, Pa., aged 68 years.

Prof. Haldeman has long been noted also for his devotion to Entomology. He attended the late meetings of the Entomological Sub-section of the American Association for the Advancement of Science, at Boston, in August, and took an active part in the discussions. At that time he seemed to be in good health and spirits. By his genial disposition and open generous bearing he has endeared himself to a large circle of friends, who will sincerely mourn his loss.

The Canadian Entomologist.

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NOTES ON ORTHOPTERA.

BY PROF. CYRUS THOMAS.

Œdipoda obliterata, nov. sp.

Male and female. Length to tip of elytra 1.50, to tip of abdomen 1.10 to 1.30. Pale reddish-brown or dull yellowish tinged with rufous, with irregular transverse bands of dark fuscous spots.

Occiput not prominent. Vertex broad, moderately deflexed, margins with sharp carinæ forming a distinct sub-quadrate, median foveola, which is divided into two equal sections by a distinct longitudinal, median carina that extends back part way upon the occiput; sides of the foveola parallel between the eyes, and bending abruptly inward toward the fastigium in front, continuous with the sides of the frontal costa; fastigium with a double indentation. Frontal costa slightly sulcate, sub-tricarinate at the fastigium, widening at the ocellus and extending nearly or quite to the clypeus, but not expanding below; in the male the width is about uniform throughout. Pronotum with the median carina sub-cristate, distinctly and deeply notched about the middle by the posterior sulcus; anterior portion irregularly arched, more elevated than the posterior portion, which has only the front part arched; lateral carina irregular and indistinct; the notch of the median carina is of the oblique type, more distinctly so in the male than in the female. Posterior lobe expanding rapidly from the posterior sulcus; nearly flat on the disk, which is more or less covered with elongate rugosities, more distinct and numerous in the female than in the male; posterior extremity obtuse-angled; anterior margin extended in a very obtuse angle upon the occiput. Elytra extending about one-third their length beyond the abdomen, of medium width, sinuous and obliquely excised at the tip. Wings narrow, the length very nearly twice the width, and slightly undulate on the outer margin; the nervules unusually regular and straight. Posterior femora with sharp and elevated carinæ above and below. Antennæ rather short, scarcely flattened and very slightly accuminated at the tip.

Color (recent specimens dried).—Female somewhat darker than the male; face pale purplish, dotted with fuscous; occiput and pronotum fuscous brown, the latter with a carneous stripe along each lateral carina, which connect at the anterior sulcus and fade out near the posterior extremity; the disk of the posterior lobe dark brown. Elytra pale dirty yellow, slightly tinged with rufous, crossed by three irregular bands formed of dark fuscous spots, the middle one broadest and usually the best defined; apex with irregular cellular fuscous spots, those next the costal margin most distinct. Wings pellucid, with a narrow marginal, rather pale, fuscous band, commencing behind the sub-costal area, where it is broadest, narrowing and fading toward the anal angle; the nerves and nervules, except in the apical portion of the subcostal area and in the fuscous band, pale yellow or white. Posterior femora crossed externally and internally by three oblique fuscous bands; posterior tibiæ pale yellow, spines tipped with black.

One male and one female from Sierra Valley, California, furnished by Mr. J. G. Lemmon.

This species approaches very near Mr. Scudder's *Trachyrhachys*, but appears to belong to *Œdipoda* as at present limited; if Mr. Scudder's genus *Dissosteira* (of which he has given but an incomplete diagnosis) stands, this species will scarcely find a lodging place in any of the numerous genera of this group.

In his paper on the Orthoptera collected by Lieut. Wheeler's Survey, published in 1876, where he first proposes this genus, he makes the following statement: "Stal's limitations of the genus *Œdipoda*, in his "Recensio Orthopt. I., forces us to consider *Gryllus coerulescens* Linn. as "the type, and not, as stated by Thomas, *Œdipoda carolina* (Burm.)."

He alludes to a statement made in my paper on Orthoptera in a previous report of the same Survey, where I simply remarked that Stal has retained our *Œ. carolina* and that this "appears to be his typical [species]" (by typographical or clerical error, "genus"). By reference to Proceedings Davenport Acad. Nat. Sci., vol. 1, 1876, page 257, it will there be seen that I made the following statement in reference to the genus *Œdipoda* as given by Stal: "In my opinion *Œ. coerulescens* Linn. "is the proper type of *Œdipoda*." This paper was published in June and July, 1876, the entire manuscript having been forwarded to Mr. Putnam some time previous thereto. I can not give the exact date of pub-

lication of Mr. Scudder's paper, but his letter of transmittal to Lieut. Wheeler bears date Cambridge, Mass., May 29, 1876.

I simply mention this in justice to myself.

As I have here referred to this paper by Mr. Scudder, I may as well correct another error he has fallen into in reference to *Anabrus Haldemanii* Gir. He remarks (page 500) that "he [Thomas] further confuses "his readers by stating that *A. Haldemanii* Gir. has the prosternum dis- "tinctly spined, whereas it is as clearly amucronate as the prosternum of "*A. simplex*." He falls into this error because he has not, or had not then, seen a specimen of *A. Haldemanii*, which has the prosternum distinctly spined. The description and figure given in Marcy's Red River of Louisiana are so exact that with a true specimen in hand, as I now have before me, there is no possibility of making a mistake. This species is never, as I learn he supposes, found west of the Rocky Mountain range, nor *A. simplex* east of it, unless possibly in Montana.

Cratypedes Putnami Thos.

Mr. A. J. Chipman, who visited Southern Colorado this season on behalf of the U. S. Ent. Commission, was fortunate enough to obtain a fine specimen of this species, in color. From this I can now give the colors omitted in my original description: Base of the wings lemon yellow; hind tibiæ bright red. In the female the yellow spots of the elytra are not so distinct as in the male; the same is also true in reference to the dark bands on the posterior femora.

At the close of his "Century of Orthoptera" (Reprint from Proceedings Bost. Soc. Nat. Sci., vols. 12–20, 1879, pg. 84) Mr. Scudder, in speaking of *Hippiscus lineatus* Scudd., remarks as follows:

"*Hippiscus lineatus.* This species I had formerly described (in MSS.) "under the new generic name *Cratypedes*, but before publishing con- "cluded it best to include it in *Hippiscus*. I do not recollect that I have "ever mentioned this name to any one and have never seen more than "the single specimen of the species upon which I had proposed to found "it, and which has never left my collection. It was therefore a complete "mystery to me to find a closely allied species described by Mr. Thomas "(Proc. Davenpt. Acad. Nat. Sci., I., 257-58) as *Cratypedes Putnami*, "with the remark: 'I have placed this species in this genus with some "'hesitancy, yet it certainly agrees very closely with it.' I disclaim any "proprietorship in the generic name, and do not know to what Mr.

" Thomas refers. This remark is offered simply to aid any future student " who may search for the origin of the name."

This statement by Mr. Scudder indicates a forgetfulness on his part of what he has written, as the reader will see by referring to " List of Orthoptera collected by Dr. A. S. Packard in Colorado and the neighboring Territories, during the summer of 1875," pg. 267, where he will find the following statement: " *Stenopelmatus oculatus* and *Cratypedes lineatus* " are described from specimens dried after immersion in alcohol." This remark is offered simply to aid any future student who may search for the origin of the name.

DESCRIPTION OF A NEW SPECIES OF PAMPHILA FROM FLORIDA.

BY W. H. EDWARDS, COALBURGH, W. VA.

PAMPHILA BYSSUS.

Male.—Expands 1.6 inch.

Upper side dark glossy brown; the basal half of costa of primaries ferruginous, as well as a little of cell below adjoining; at the end of cell an irregular yellow-fulvous bar within; across disk a bent yellow-fulvous band, starting on costal margin about three-fifths the distance from base to apex, bending round cell and continued to middle of submedian nervure, narrow at top, but below cell widening rapidly; the basal half of inner margin washed fulvous. Secondaries have a fulvous patch on middle of disk, usually sub-ovate, but sometimes connected with a fulvous patch in cell which runs toward base; the hairs of basal area next inner margin fulvous; fringes of primaries dark gray-brown, of secondaries lighter.

Under side wholly ferruginous (individuals varying a little in shade), except that the posterior half of primaries from hind margin to base is blackish; the spots of upper side repeated indistinctly; on secondaries in most examples the surface is immaculate, in others there is a faint paler color indicating the patch of upper side; the nervures and branches on secondaries are a shade more yellow than the ground color.

Body above covered with fulvous hairs on black; beneath, the thorax

and ventral part of abdomen yellowish, the sides of abdomen ferruginous; legs ferruginous; palpi yellowish; antennæ black and fulvous, annulated; club black, the tip red-ferruginous.

Female.—Expands 1.6 to 1.7 inch.

Upper side of same brown as the male, and marked with fulvous in a similar manner, but the band is narrow and of nearly uniform width throughout, except at the bend opposite cell, where it is much restricted. Under side as in the male, but in six cases out of seven the band of upper side of secondaries is indicated below with much distinctness.

In one male under examination the fulvous band is diffused, and the basal area is also fulvous, so that all the wing is of that color except a stripe around end of cell, and the hind margin.

From 20 examples, 13 ♂, 7 ♀, received from Indian River, Florida, this season.

In size this species ranks with *Arpa*.

The male much resembles in general appearance the female of P. *Delaware* Edw. Both these species are without the sexual mark on primaries of the male. The female *Byssus* is unlike any of our species.

SOME NEW SPECIES OF TINEINA FROM NORTH AMERICA

BY V. T. CHAMBERS, COVINGTON, KY.

In the proceedings of the Zoological Society of London, Feb. 17th, 1880, is an interesting contribution to the Tineidæ chiefly of this country, by Lord Walsingham, entitled "On Some New and Little Known Species of Tineidæ." The author states, from a comparison of specimens and figures of *Adela schlœgeri* Zell. (which I had previously recognized as *Adela (Dicte) coruscifasciella* Cham.), that it is identical with *A. Ridingsella* Clem., preserved in the collection of the Entomological Society of Philadelphia; a fact which I should not have suspected from Dr. Clemens' description of *A. Ridingsella*.

Lord W. is also probably correct in the statement that *Adela trifasciella* Cham. is the ♂ of *A. trigrapha* Zell. He also figures and describes the

following new species : - *A. septentrionella*, *A. singulella*, *A. lactimaculella*, *A. simpliciella* – from the Pacific Coast, besides two new Indian species, *gemmella* and *A. grisseela*. The pamphlet also contains a description and figure of *Incurvaria solenobiella*, and two species of Micropteryx (*M. pardella* and *M. aurosparcella*) also from the Pacific Coast. Of this latter genus *M. pomivorella* was, as stated in my "Index," the only known species "from the United States and Canada," though another species—*M. luteiceps*—had been described by Walker from Nova Scotia The author leaves it doubtful whether *Hyponomeuta ordinatellus* Walker is the same with *H. multipunctellus* Clem. *Anesychia sparcicella* in my "Index" is a misprint for *sparciciliella*. Unfortunately, from circumstances beyond my control, there are too many such misprints in the "Index." The species is known to me only by Dr. Clemens' description of it. Lord Walsingham states that it is a *Cryptolechia*, not a *Hyponomeuta*. He is no doubt right in the opinion that *A. hagenella* Cham. should be referred to *Psecadia* Hub., if there is any sufficient generic distinction between *Anesychia* and *Psecadia*, of which I am not convinced.

Psecadia monticola, *P. arctostaphylella*, *P. subcærulea*, *P. albistrigella* are described and figured as new species from our Pacific Coast, *P. cupreonivella* from Brazil, and *P. ermineella* and *P. hockingella* from India. The author seems to have some doubt whether *P. arctostaphylella* and *P. subcærulea* are really distinct, but so far as we are able to form an opinion from the figures they seem to be distinct enough. *Arctostaphylella* bears some resemblance to *Anesychia (Psecadia) trifurcella* Cham.

Two new species of *Lampronia* are described and figured: *L. oregonella*, the name of which indicates its locality, and *L. tripunctella*, purchased in a miscellaneous collection from North America. These are especially interesting as the first notice of the discovery of a species of this genus in this country.

The above are the only species described in the paper, and all are illustrated by beautiful figures. But little is known of the Tineina of the Pacific Coast ; and so far as I have been able to learn, Lord Walsingham is the only one who has collected them, who is also familiar with the group. It is to be hoped that he will follow up this contribution by others like it, especially as to the smaller species, which are the most interesting, and as to which almost nothing is known. There is here also a splendid opportunity for some Entomologist resident on that coast.

NOTES ON A FEW AMERICAN BOMBYCES.

From ALFRED WAILLY (Membre-Lauréat de la Société d'Acclimatation de France), 110 Clapham Road, London, S. W., England.

In my Report on Silk-producing Bombyces and other Lepidoptera, reprinted from the "Journal of the Society of Arts," Feb. 13th and March 5th, 1880, I speak of the disastrous effects of the weather on most species during the year 1879.

This year (1880), although the splendid weather we had in August and at the beginning of Sept. allowed of the successful rearing of several species in the open air, the wet and cold weather lasting till about the end of July affected and retarded Lepidoptera, as in 1879; the moths of *Samia promethea*, for instance, had not all emerged before the end of August. With a few exceptions, none of the Indian species emerged at all, and ova of many well-paired female moths were partly infertile.

Actias luna I bred this year for the first time, and most successfully on Walnut. I obtained 12 or 13 pairings in June.

Samia Gloveri.—I received a considerable number of cocoons of this species from a young and active Entomologist, but, I regret to say, this was the most complete failure that can be recorded. The moths emerged from the middle of April till the middle of July. With a few exceptions, I had only crippled moths; the greater part of the cocoons did not produce any moths. Not a single pairing could be obtained. I shall be glad to try this species again.

Samia ceanothi.—With about 40 cocoons I obtained the first moth in March, the second on April 3rd, and the rest continued to emerge till the 18th of July. Only two pairings were obtained. Not having Ceanothis to feed the larvæ, I reared them on Plum and Willow, but they did not thrive, and they all died, some going into third stage. Evidently Plum or Willow are not proper food plants for *ceanothi* larvæ. The first pairing took place on the 27th of June, the second on the 10th of July. The ova of the first brood hatched 18 days, and those of the second 15 days after being deposited. The larvæ, of a lighter color, but somewhat similar to those of *cecropia* in first and second stages, showed a difference from that species in the third stage, being thus: Back of body sky blue; sides greenish yellow; tubercles golden yellow *all along the back;* tubercles on the sides blue; head green.

Hybrid *Ceanothi-Gloveri.*—Although *Gloveri* moths refused to pair among themselves, I had several crossings between *Gloveri*, *ceanothi* and *cecropia*. The ova obtained from a long pairing of *ceanothi* ♀ with *Gloveri* ♂ were the only ones which were fertile. Unfortunately the larvæ bred on Willow and Plum died, some reaching the third stage like *ceanothi*.

The pairing of *ceanothi* and *Gloveri* was from the evening of the 20th to the evening of the 21st of May. The larvæ hatched from the 15th to the 21st of June, the majority having hatched on the 16th and 17th.

First stage—Larger larvæ, black; smaller ones follow, the colors becoming of a more uniform hue as the larvae increased in size. They looked like *cecropia* larvae.

Second stage—Larvae yellow, with black tubercles; head black.

Third stage—Back bluish, sides yellow; tubercles on back orange-red, tubercles on the sides blue; head yellow.

Eight larvae, the produce of a pairing of female *Saturnia Pyri* with unknown *Samia* (the pairing was not seen), lived seven days on Plum; they were bright yellow with a dark ring round each segment.

The other crossings obtained were: June 12th and 13th, *ceanothi* ♀ and *cecropia* ♂; June 13th, *Gloveri* ♀ and *cecropia* ♂; June 18th and 19th, *cecropia* ♀ and *ceanothi* ♂. In all the above cases the ova were infertile.

NOTES ON LEPIDOPTERA.

BY H. S. JEWETT, M. D., DAYTON, OHIO.

EUCHAETES COLLARIS, Fitch.

On June 7th, 1879, I obtained some eggs from a ♀ captured the day before. The eggs were smooth, pale green, spherical in shape and $\frac{1}{32}$ inch in diameter. The eggs hatched on the 12th. Larva $\frac{1}{16}$ inch long, pale green, largest at middle of the body and tapering slightly towards both ends. Head slightly bilobed, of a faint brownish color, with a dark brown spot on each side. The first segment has three minute brown tubercles on each side of the dorsal line, and a large oval, though but slightly elevated, dark brown tubercle on the dorsal line. The remaining segments have no tubercle on the dorsal line, but the second, third and

twelfth each have four ; the fourth and fifth each have six, and the sixth, seventh, eighth, ninth, tenth and eleventh each have five small dark brown tubercles on each side of the dorsal line. These tubercles are arranged in two rows around each segment ; the tubercles in the anterior row alternating with those of the posterior row on the same segment. Each tubercle gives rise to a tuft of fine white hair.

The larvæ moulted for the first time on the 20th. They were then $\frac{5}{8}$ inch in length and nearly cylindrical in shape. Head white, faintly bilobed. Larva pale bluish-green. Tufts of hair, arising from the tubercles, white and somewhat longer than prior to moulting, and some of the hairs branched. In other respects the larva is unchanged.

The larvæ moulted again on the 24th. They now measure $\frac{1}{2}$ inch in length, and are entirely pale green in color. The tufts of white hair are now quite long (as long as the diameter of the larva), and very many of the hairs are branching ; some being sparsely and the largest thickly branched. The tufts of hair on the three anterior and posterior segments are somewhat longer than on the rest of the body. The hair of some of the larvæ is pearl gray in color instead of white.

The larvæ passed their third moult on the 27th. They are now $\frac{5}{8}$ inch long. Body entirely pale green. Head greenish white. The tufts of hair are more dense and longer and a little inclined to unite in pencils. Otherwise as in last moult.

The larvæ quit feeding on the 3rd of July and began to make cocoons on the 4th. The full grown larvæ are $\frac{3}{4}$ to $\frac{7}{8}$ inch in length. The lengths given are of the larvæ when at rest ; in motion they are about one third longer than the measures mentioned.

The cocoons are very slight and are made up of the hair of the larva held together with a little silk. The pupa is dark brown (nearly black) and is closely punctate. The anterior extremity is sub-quadrate and the segmental extremity blunt. The pupa is one-half to five-eighths inch long by three-sixteenths inch in diameter.

The imagines emerged July 14th to 16th, which makes the time necessary to complete their transformations (from egg to imago) thirty-seven to thirty-nine days. The insect has here from three to four broods each year, the fall brood hybernating in pupa. The larva here feeds on *Asclepias incarnata* L., and refuses to eat *Asclepias cornuti* even when they are just emerged from the egg and have never yet eaten any food. The

larva feeds by night and hides during the day, and is very easily reared in confinement.

EUCHAETES EGLE, Harris.

I placed a pair of reared specimens with a plant of *Asclepias cornuti* under a net, and on June 3rd found the ♀ depositing eggs. The eggs are laid in batches on the under surface of the leaf, sometimes in a single layer, and sometimes two or even three layers are superimposed one on the other. They are deposited in and covered with fine short hair, thus closely simulating the downy under surface of the leaves on which they are laid. The eggs are smooth, spherical, pale green and $\frac{1}{32}$ inch in diameter. The eggs began to hatch on the 14th.

Larva green, $\frac{1}{8}$ inch long and nearly cylindrical in shape, with the segments strongly marked by the depth of the dividing incisions. Head shining, glossy black, subquadrate and very faintly bilobed. There are eleven rows of tubercles arranged in two ranges on each segment; the tubercles of the anterior range alternating with those of the posterior range on the same segment, one of the tubercles being on the dorsal line. The tubercles are small, but slightly elevated above the surface, and of the same color as the body. Each tubercle gives rise to one or two black and several fine white hairs. Legs and prolegs are tipped with reddish-brown.

This carries the history of this insect to the point where Prof. Lintner, of Albany, N. Y., begins in his "Entomological Contribution, No. II.," page 136 of the "Twenty-fourth Report on the State Museum," to which readers are referred for the remainder of its history.

The insect completes its cycle in from 48 to 50 days, has here three broods during the season, and hybernates in the pupa state. A few of the pupæ from second brood (and probably also of first) hybernate. It is extremely subject to the attack of a small ichneumon fly, so much so that out of *two hundred and fifty odd* larvæ (gathered and raised by me in the summer of 1878) only *twenty-eight* were non-ichneumonized, and of these twenty-eight only *nine* yielded imagines after hybernating; the rest had dried up. The first brood reared from eggs last summer did as well as any other species. The fall brood (from eggs) made pupæ readily, but it remains to be seen how they bear hybernating.

I have found and reared the following larvæ, but my notes are too imperfect to give descriptions of them:

Chrysophanus thoe Bd.-Lec., on *Rumex Britannica* L.

Nerice bidentata Walk., on Elm.
Eudryas unio Boisd., on *Epilobium coloratum* Muhl.
Amphion nessus Hübn., on " " "
Deilephila lineata Harr., on " " "
Hemaris marginalis Grote, on *Lonicera sempervirens* Ait. ; and on *Triosteum perfoliatum* L.

DESCRIPTION OF THE PREPARATORY STAGES OF EUPTOIETA CLAUDIA, Cramer.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG—Conoidal, depressed at top, flat at base, shaped generally like the eggs of Argynnis (*Idalia, Cybele*, &c.), but taller in proportion to its breadth than in the species named, with the sides less rounded ; marked by about 20 prominent, vertical, straight ribs, half of which extend from base to summit, forming around the depression a serrated rim, the rest ending irregularly at two fifths to four fifths the distance from base, the shorter ones occasionally joining the others ; marked horizontally by numerous prominent striæ. Duration of this stage from 5 to 12 days, according to the season.

YOUNG LARVA—Length .1 inch ; cylindrical, thickest from 6th to 9th segment, tapering slightly to head, rapidly to 13 ; greenish-yellow, translucent ; each segment from 3 to 12 rounded and crossed transversely by two irregular rows of dark tuberculated spots or points on a pale ground, each spot sending out a black hair ; on 2 is a black stripe across dorsum ; head a little broader than 2, rounded, black, with many fine hairs. Duration of this stage from 2 to 4 days.

After 1st Moult—Length .15 inch ; color reddish-yellow, with two dorsal and one lateral row of indistinct whitish spots, which cover the junction of the segments and are in line with the spines ; these last form six rows, and are short, fleshy, tapering, black, and of nearly equal length ; each spine beset with many short and fine black hairs (for arrangement of the spines, which is uniform in all the succeeding stages, see description of the mature larva) ; on 2 is a reddish collar edged by white ; head bilobed, the vertices rounded, shining black. To next moult 2 to 3 days.

After 2nd Moult—Length .3 inch; color a shade darker, the spines lengthened, those on 2 measuring .05 inch, being considerably longer than the rest, directed a little forward and somewhat recurved; the white rows more distinct and more complete, and stand on narrow pale brown bands; head as before. To next moult 2 to 6 days.

After 3rd Moult—Length .55 inch; much as at last preceding stage, the red darker, surface highly polished, the spines blue-black, shining; those on 2nd row .12 inch long, and more porrected, the others but .04 inch; head brown-black, red behind the vertices. To next moult 2 to 5 days.

After 4th Moult—Length just after this moult .7 inch; 24 hours after same .9 in., and in 3 days reached maturity.

MATURE LARVA—Length 1.2 inch; cylindrical, slender, of nearly even size, the last 4 or 5 segments tapering but slightly; each segment rounded; color orange-ochre, the surface smooth, polished; striped longitudinally with black, which is almost concealed by the white spots which cover it; two of these stripes are sub-dorsal, and on each side just above the spiracles is another; usually there are five white spots between each pair of spines; over the feet is a macular white stripe; on mediodorsal line on segments 4 to 12 is a small white elongated spot, edged with black, one on summit of each segment; the spines are in six rows, two sub-dorsal, standing on the black stripes and running from 2 to 13; one on each of the lateral stripes, and running from 5 to 13; but in line with these is a spine placed between 2 and 3, and another between 3 and 4 (no spine on 4); the other rows are infra-stigmatal, and run from 5 to 12; the dorsals on 2 are orange at base, as are also those between the anterior segments, but all others rise from lustrous blue-black conical tubercles, and all spines are blue-black, slender, a little thickened at top, and beset thickly with fine short black bristles standing at right angles to the stem; the spines are of nearly uniform length, measuring .06 inch, except the dorsals on 2, which measure .2 inch; these are slender, tapering to about four fifths their length and then enlarge into an ovate elongated club; they are directed forward across top of head, are straight or a trifle bent down, and when the larva is at rest lie in the plane of the body, and are divergent; when the larva moves, it moves its head incessantly from side to side, and these long spines much resemble antennæ, but are not flexible, and can only move with the segment; between this pair of spines is a chitinous black patch, and on the anterior edge of the segment on

dorsum a white spot ; under side dark or blackish-brown ; on this side segments 5 and 6 are crossed by a belt of minute blue-black tubercles with fine hairs, and a few like these are seen on 11 and 12 ; feet and prolegs black ; head smaller than 2, sub-cordate, flattened frontally, the vertices rounded ; surface lustrous, brown-black, behind the vertices orange-red, with a patch of this color on middle of front, and another along the ocelli ; somewhat pilose.

CHRYSALIS—Length .8 inch ; cylindrical, thickest in middle ; the head case truncated, rounded transversely, and also at either side, where the eye-cases are quite prominent ; mesonotum elevated, sub-conic, followed by a rounded excavation ; the wing cases flaring at base, compressed in middle, and round rather abruptly to the abdomen ; upon the abdomen four rows of conical tubercles, corresponding to the dorsal and upper lateral spines of the larva, and the two dorsal extend to upper side of mesonotum ; color pearl-white, iridescent, marked with dark brown patches and points ; the wing cases are often nearly covered with brown, on which the neuration is indicated by orange lines ; but there is much variation, the brown area on the wings often being limited to a few stripes along the nervures ; the antennæ cases annulated orange and brown, and edged by brown ; the eyes marked by a brown lunation containing an orange line ; at the top of head case a circlet of brown points about a central one of same color ; other small patches and points about the head and at base of mesonotum ; on the abdomen brown points in pairs between the tubercles parallel to the long axis of the body ; the tubercles gold, burnished, either with or without brown lunations at base. Duration of this stage in summer 7 days.

Eggs laid 14th July, 1880, hatched 19th ; the 1st moult was passed 21st ; 2nd moult 24th ; 3rd moult 26th ; 4th moult 28th ; in chrysalis 2nd Aug.; imago out 9th Aug. From laying of egg to imago 26 days.

Claudia is found throughout the Southern and Western States ; is occasional in New York, and even in New England. It inhabits tropical America and some of the West India Islands, and also parts of South America. The larvæ feed on any species of Passiflora ; also on Viola and Sedum, and probably other plants. In 1871 I received from Mr. T. L. Mead, then in Colorado, a plant of Sedum by mail, about 10 days on the road. On opening the package I found a caterpillar of *Claudia*, which had hatched on the road and had passed its second moult. I kept it for some days and it fed altogether on the flowers of the Sedum. Here

at Coalburgh the butterfly is not very common, but I see several examples every year about the flowers. It flies and behaves like Argynnis. The female will lay eggs readily when confined with Violet or Passion-vine, but prefers the latter, and if the two plants are offered the larva the vine is preferred. The larvæ of the summer brood mature rapidly, but those of the fall brood probably hybernate when half grown. On 12th September, 1873, I obtained a number of eggs, part of which were laid on Passion-vine. part on Violet. The caterpillars which fed on the vine grew more rapidly than the others, and began to pupate 20th October, and this continued for two weeks, up to 9th November. Between 25th November and 5th December many butterflies emerged. Inasmuch as I have several times seen *Claudia* flying on warm days in November. I conclude that the butterfly must hybernate. But while the larvæ fed on Passion-vine were pupating, those on Violet were none of them mature and some were very small, only past 2nd moult. I kept these in a warm room, giving them all the sunlight possible. When the sun shone directly on them they were active and fed vigorously, but when the sky was clouded they remained quiet, sometimes for days together. All but one died before maturity, but this one continued to feed at intervals till 22nd March, and died just as pupation approached. I infer, therefore, that in favorable circumstances the larvæ would hybernate.

The larvæ of *Claudia* are exceedingly active, and travel with rapidity. On one occasion Mr. Mead found a mature caterpillar on an alder, four feet from the ground, resting during the day. No violet or known food plant was near, and the caterpillar starved two days rather than eat alder, and finally was fed violet. It was probable that it had travelled a considerable distance to rest, and returned at night to its feeding place.

The egg resembles closely that of Argynnis, and might stand in same genus. The chrysalis resembles closely that of Melitaea. But the larva is very unlike Melitaea, and almost as unlike Argynnis. The imago itself looks like a magnified Argynnis *Bellona*, and because it does, Hubner placed the two in the same coitus. In Boisduval and LeConte the species stands in Argynnis. I am not able to discover, by a comparison of prepared wings of *Claudia* and of several species of Argynnis, any difference in the neuration between Euptoieta and Argynnis. Owing to the resemblances spoken of in the different stages, I placed Euptoieta between Argynnis and Melitaea in my Catalogue (1877), instead of before Argynnis as Kirby gives it, and I am of opinion that I did right.

The larva of *Claudia* is really a beautiful object, surpassing in this respect any butterfly larva known to me. The chrysalis is of lovely shape and color, the pearly surface giving all the colors of the rainbow, while the tubercles are golden and the spots brown with here and there orange. I am sorry, therefore, that Boisduval and LeConte, after Abbot, give wretched figures of such admirable objects. The larva, especially, looks like a daub from a penny toy book.

ON THE EARLY STAGES OF FOUR GEOMETRID MOTHS.

BY L. W. GOODELL, AMHERST, MASS.

OCHYRIA DESIGNATA, Pack.

Mature larva, five specimens.—Head roundish, flattened, as wide as the first segment, yellowish green ; jaws brown. Body thickest at the 9th segment, attenuated anteriorly ; yellowish green, the dorsal and subdorsal spaces reticulated and lined with brown ; a narrow stigmatal brown line and a dorsal row of triangular brown spots, one each on the 4th, 9th and 10th segments, and two on each of the intermediate ones ; a minute substigmatal black spot on the anterior part of each segment from the 6th to 9th. Length when at rest 16 mil.; when crawling 18 mil. Found in October on *Alyssum maritimum*. Pupated within a slight web on or just beneath the surface of the ground.

Pupa.—Length 8 to 9 mil., very dark shining brown, almost black, the spaces between the abdominal segments much lighter ; caudal spine round and forked.

EUCROSTIS CHLOROLEUCARIA, Pack.

Mature larva, 44 specimens.—Head small, about half as wide as the first segment, subquadrate, deeply bifid, deep green with a light brown band. Body thickest behind, much attenuated anteriorly. The general color varies from yellowish to bluish and dark green, partaking somewhat of the color of the flowers on which they feed. There is a straight, dorsal reddish brown stripe which is very conspicuous on some specimens and much broken or entirely wanting on others. Two very small, dorsal

light brown tubercles on the first segment. Average length when at rest 21 mil.; when crawling 22 mil. Feeds on the flowers of Thoroughwort *(Eupatorium perfoliatum)*, Yarrow *(Achillea millefolium)*, and various species of *Helianthus* and *Aster*. Pupated in an imperfect earthen cell.

Pupa.—Length 7 to 9 mil.; whitish horn color, some specimens tinged with red, minutely speckled with black ; a straight, black dorsal stripe and two rows of irregular black spots on the venter, and a more or less distinct stigmatal row of smaller ones of the same color. The wing cases vary from light to very dark brown or black, the body and wings of one specimen almost entirely covered with black.

EUTRAPELA TRANSVERSATA, Pack.

Mature larva, one specimen.—Head a little wider than the first segment, flattened, purplish brown. Body rather slender, thickest behind, slightly attenuated anteriorly, carinated on the sides. The color is dark purplish brown mixed with reddish ; a dorsal reddish gray crescent-shaped spot on the middle of the 7th segment, behind which is a pair of low kidney-shaped tubercles, and a pair of dorsal, pointed, black ones on the 11th. The 2nd ring is swollen on the sides. Length when at rest 44 mil.; when crawling 46 mil. Feeds on Red Maple *(Acer rubrum)*. It changed to a pupa within a rolled leaf July 24th, and the moth was discovered Aug. 10th.

Pupa.—Pale flesh color, minutely speckled with brown, greenish between the segments ; a stigmatal row of large roundish brown spots, one on each abdominal segment, and a dorsal row of obscure triangular spots on the abdomen which are obsolete on the last three rings ; a dorsal brown dot on the thorax, with two smaller ones behind it. Wing cases darker than the abdomen. Caudal spine compressed laterally, dark brown. Length 13 mil. ; width in the widest part 5 mil.

ACIDALIA ENUCLEATA Guen.

Egg.—Oval, dull red, with 14 angular ribs, the concave depressions between with numerous transverse striæ. Length, 0.7 mil., width 0.4 mil. Duration of egg stage 9 days.

Young larva.—Length 2.8 to 3 mil. Head twice as wide as the body, round, flat in front. Body very slender, brown on the back, growing lighter colored behind and beneath ; and on each segment are about five long, hair-like, club-shaped processes.

ENTOMOLOGY FOR BEGINNERS.

On Two Mites.

BY THE EDITOR.

But little is generally known regarding the life history and habits of mites. They have not yet engaged the attention of many naturalists, still their tribes are many, and the hosts of individuals composing them "too numerous to mention." We purpose to present our readers with a few facts relating to two of the better known species of mites.

The Red Spider, *Tetranychus telarius*, is a serious pest to gardeners, and one which all those who have to do with plants under glass are more or less familiar with. Fig. 22 represents the male of this species very much enlarged, the mite itself being scarcely visible to the unaided eye. The characteristics of this genus of mites seem to show a special affinity with the spiders in their habit of spinning webs, for which purpose the claws of their feet are specially adapted. The mouth has a barbed sucking apparatus by which the sap is sucked from the minute vessels in the leaves of the plants they attack. These mites vary very considerably in color, influenced much in this respect by the food they devour; some are greenish and marked with brown specks on the sides, others are rust-colored, or reddish, or even brick red, the latter being the color with which horticulturists are most familiar. It is probable that most of the individuals acquire more or less of a reddish hue when fully mature. The natural size of this mite is indicated by the dot enclosed in the small ring on the side of figure.

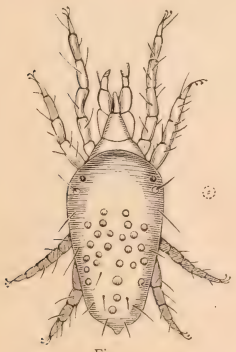

Fig. 22.

This mite spins a web on the under side of the leaves, of the finest and most delicate texture, the threads being so slender that one fails to see them even with the help of a magnifying glass until after they are

woven into a web or net-work. The threads are secreted from a conical protuberance situated underneath and near the extremity of the abdomen, and they are drawn out and guided by the motions of the insect and by the action of the minute claws of the feet. In constructing the web the feet are moved quickly and the threads are attached to the hairs and other prominences of the leaf, and under this shelter will be found a colony consisting of many mature individuals of both sexes and young mites of all ages, which feed and multiply rapidly. By the aid of their jaws, which are not unlike the beak of a bird, they tear away the surface of the leaf, and then plunge their beaked suckers into the wound and suck the juice.

The eggs of this mite are nearly round, colorless, and large in proportion to the size of the insect. The larva is a minute transparent object, not unlike its parent, but it has only six legs and creeps slowly. The leaves of the plants attacked soon indicate the presence of this invader by their sickly hue; the sap being sucked by myriads of tiny mouths, the leaves are deprived of their natural nourishment, and soon assume a yellowish hue, with patches of a greyish or lighter shade; the under surface becomes whitish, and if the mite is allowed to pursue its course unchecked, the gardener soon finds his cherished flowers and shrubs much injured or destroyed.

These insects are said to pass the winter under stones, concealing themselves there when the leaves they have fed on have fallen.

The remedies used for such enemies as the Red Spider are various preparations of sulphur and soap, used separately or together, mixed with water and applied to the plants with a syringe. Sulphur in any form seems useful; laying it in powder upon the pipes in the green house has been recommended. Plain soap and water is said to be effectual; indeed water alone freely used is regarded by some as sufficient. It is well known that the insect thrives best in a dry atmosphere. In applying any of these liquids, to insure success it is necessary that it be used so as to wet the under-side of the leaves; if applied to the upper surface only the mites may remain attached to the lower side with perfect security during the entire operation. The gardener is aided in his war against this pest by other mites and insects which prey upon them. The larvæ of the Lace-wing Flies and other friendly insects are said to devour large numbers of them.

The Common Cheese Mite *Tyroglyphus siro.*—This tiny creature, scarcely visible to the unaided eye, is soft, smooth and fleshy, with a whitish body and feet furnished with suckers and claws. Figure 23, which represents one of these mites highly magnified, will convey a better idea of its general aspect than any verbal description we can give. It lives in almost every kind of cheese when a little decayed, and particularly in the harder portions. When in a warm atmosphere they are active, constantly gnawing at the cheese and reducing it to powder. This powder is composed of little greyish balls of excrementitious matter, eggs, both empty and unhatched, larvæ, pupæ, and perfect mites, with cast skins and fragments of cheese. Exposed to a low temperature, the individuals soon gather into groups or heaps in hollow places in the cheese, and there remain in a state of torpidity until awakened again by warmth. This mite is also found in flour.

Fig. 23.

It multiplies very rapidly either in cheese or flour. A few specimens transferred from a mitey cheese to an old cheese not mitey, will soon colonize it thoroughly. They are probably harmless, since there are no records of any disease occasioned by them, although they are daily eaten in numbers too great to be estimated, and so carelessly, that hundreds of living individuals must escape the grinding of the molars and be swallowed alive.

WALSINGHAM'S PTEROPHORIDÆ OF CALIFORNIA AND OREGON.

BY CHARLES FISH, OLD TOWN, MAINE.

I desire to call the attention of Entomologists to a very valuable contribution to Entomological literature recently made by Lord Walsingham. The work is entitled *Pterophoridæ of California and Oregon*, and is published in an octavo volume very neatly gotten up, and containing sixty-six pages of letter press, fully illustrated by forty-eight colored figures on

three plates. Forty-one species are figured, of which three do not belong to the Pacific fauna as far as known, but are given for convenience of comparison. Twenty-seven new species are described.

The material for this work was collected by the author during a sporting expedition extending from the middle of May, 1871, to the end of June, 1872. The author alludes to the close resemblance to European forms presented by this group, and which appears to be a general characteristic of the Lepidopterous fauna of Western North America. Some species were found to present extensive variations in size and color, and in one or two cases the variation was so great that had not the intermediate connecting links been found, the extreme forms must have been considered as distinct species. This variation was particularly observable in the genera Amblyptilus, Œdematophorus and Lioptilus.

The European species, *Platyptilus Bertrami* Rossl., *Amblyptilus cosmodactylus* Hübn., *Pterophorus monodactylus* Linn. and *Alucita hexadactyla* Linn., were found. The first three of these species are also found in New England, that is, if *P. Bischoffii* Zeller is identical with *Bertrami*, as given by this author, and of which I have little doubt. This is our most abundant species in New England. I have sent examples to Prof. Zeller, who expresses the opinion that *ochrodactylus*, *Bertrami* and *Bischoffii* are one. A knowledge of the larva of our species and its habits might settle the question. I am strongly of the opinion that the larvæ feed in the stalks of our common Yarrow *(Achillea millefolium)*, since the moths are often taken about this plant, and since the European species feed in the stalks of *Achillea ptarmica* and *Tanacetum vulgare*. The moth appears in New England in June, and very probably the habits of the larvæ are similar to those of the borer of which an account is given by D. S. Kellicott, Can. Ent., vol. xii., No. 6. I would be glad of any information in regard to the larval habits of this or any other species of this group, of which I am at present making a special study.

To return from this digression — *Platyptilus cardui* Zeller = *P. carduidactylus* Riley, *Oxyptilus Delawaricus* Zeller, and *Oxyptilus nigrociliatus* Zeller, occurred in California, all three of which are found on the Atlantic coast. I have found the last named species in several collections labeled as *tenuidactylus* Fitch, and Walsingham saw it under that name in Central Park Museum, New York. If Dr. Fitch's collection should ever become accessible to Entomologists, several perplexing questions of identity might be answered. The cosmopolitan and extremely variable

species, *Pterophorus monodactylus* Linn., was found in several localities in California and Oregon. Two varieties are figured. This species is identical with *P. pergracilidactylus* Pack. and *P. cinereidactylus* Fitch. I have it from New England and Illinois, as well as from California. My specimens from California show even more extreme limits of variation than the European forms, of which I have received a set through the kindness of Prof. Zeller. Dr. Packard's *sulphureodactylus* is re-described and christened *sulphureus*, in accordance with the laws of nomenclature. Prof. Zeller is cited, who has taken the same liberty with Prof. Riley's hybrid name *carduidactylus*, reducing it to the unobjectionable *cardui*. As to the propriety of thus changing original names, I at present express no opinion. Much might be said both for and against. It is certainly desirable in naming a new species to conform strictly to the rules of zoological nomenclature, both that the names may be harmonious, and that we may not at some future time find our names degraded to the rank of synonyms.

Lord Walsingham has very generously given types of most of his described species to Prof. C. H. Fernald, of the Agricultural College, Orono, Maine, where they will be accessible to Entomologists engaged in the study of this group of insects on this side of the Atlantic. I would add that this little book of Lord Walsingham's is the first work containing anything like a full representation of the Pterophoridæ of any section of North America, and I commend it to the consideration of all who are interested in the study of the beautiful forms of this difficult and hitherto much neglected family of the Lepidoptera.

NOTES ON CATOCALA HUNTING.

BY. G. H. FRENCH, CARBONALE, ILL.

A few of the members of my zoology class and myself have taken here 821 specimens of Catocalæ in nine consecutive days, collecting from August 16th to August 26th inclusive, omitting Saturday and Sunday, during which no collecting was done. These were all taken in the afternoons, usually from one to four o'clock, by whipping the trees, and all within

easy walking distance from the University. No sugaring was done during the time. These 821 specimens represent the following species :

C. Lachrymosa, Guen.
Viduata, Guen.
Desperata, Guen.
Retecta, Grote.
Flebilis, Grote.
Robinsoni, Grote.
Residua, Grote.
Obscura, Streck.
Angusi, Grote.
Amatrix, Hub.
Cara, Guen.
C. Ilia, Guen.
Innubens, Guen.
Scintillans, G. & R.
Neogama, Guen.
Subnata, Grote.
Piatrix, Grote.
Palaeogama, Guen.
Habilis, Grote.
Nebulosa, Edw.
Amica, Hub.

I might say here that I have taken in this locality, in addition to the above, the following species :

C. Epione, Westw.
Sappho, Streck.
Judith, Streck.
Insolabilis, Guen.
Ulalume, Streck.
Unijuga, Wlk.
Coccinata, Grote.
Ultronia, Guen.
Marmorata, Edw.
C. Delilah, Streck.
Consors, Guen.
Serena, Edw.
Magdalena, Streck.
Grynea, Guen.
Nuptialis, Walk.
Fratercula, G. & R.
Lineella, Grote.
Amasia, Westw.

Besides these, I have taken two other species that I have not identified yet. Have also taken var. *phalanga* of *C. palaeogama*, and form *atarah* of *C. fratercula*.

NORTH AMERICAN MOTHS.

BY A. R. GROTE.

Packardia Goodellii, n. s.

Entirely blackish with a faint brown shading about internal angle, where are two white unequal spots as in *geminata*. Fringe blackish, concolorous, interlined with pale and with a distinct white fleck or spot below apices ; this distinguishes the moth from any of the genus. The usual lines on the primaries are lost in the ground color ; the outer line may be made

out, followed by a whitish shade on costa. The costal edge at apices is whitish. Secondaries concolorous, blackish, paler beneath ; the fringe is paler outwardly. The male expands 20 mil., the female 22 mil. The wings are wide, convex along costal margin of primaries, the apices a little pointed. Body frail, concolorous, blackish, the palpi, feet and abdomen beneath paler. Collected in Mass. by L. W. Goodell, Esq., for whom the species is named.

Hadena adnixa, n. s.

♂ ♀. Eyes naked ; tibiæ unarmed. By the excavate secondaries allied to *curvata*, *genitrix* and *fumosa*. Paler than *curvata*, of a dusty gray, shaded with brown. Sub-basal field shaded with brown with a black streak from the base below median vein to anterior line. Half-line present ; base of the ground color. T. a. line geminate, not very distinct, blackish, marked on costa, scalloped, perpendicular. Claviform outlined. Orbicular subquadrate, with a brown central clouding. Reniform narrowed above, constricted, black-ringed, upright, with a brown internal shade, crossed by the angulate brown median shade. Posterior line as in allied forms ; between the reniform and the line a pale shade, repeated between the discal spots and before the orbicular, here smaller and less noticeable. Subterminal space shaded with brown ; veins darker ; black dashes on the interspaces between veins 4 and 6. Terminal space of the ground color. Subterminal line pale, flexed ; a terminal series of black marks ; the dusky fringes uneven, with a pale line at base, interrupted with pale. Hind wings fuscous with pale extra mesial line. Beneath gray, irrorate with distinct dark dentate lines and discal spots. Collar black-lined. *Expanse* 38 mil. Nevada ; Mr. Tepper.

Hadena characta, n. s.

Allied to *curvata* and *adnixa*, but smaller and with the aspect of an *Agrotis*. Body tufted ; eyes naked ; tibiæ unarmed. Fore wings blackish gray with the sub-basal and subterminal spaces shaded with pale, and with a slight ochre stain which spreads on the dusky median space. Claviform large, concolorous, black-outlined. Orbicular well sized, rather narrow, oblique, gray, with central streak. Reniform moderate, shaded with gray, upright, constricted. Lines geminate, accompanied by gray shades, not very distinct. Posterior line followed by slight dark venular marks. Subterminal pale, irregular. Hind wings fuscous, the veins darker ; beneath

gray, irrorate, with discal spot and line. *Expanse* 30 mil. Nevada, Mr. Tepper.

Hadena chryselectra, n. s.

♂. Head, thorax, base of primaries and subterminal space of a pale golden brown, or fawn color. Median lines propinquitous, black, denticulate or lunulate, double, enclosing a whitish ochrey line. Median space shaded with whitish ochrey, especially beyond the reniform and along the anterior line. Orbicular small, spherical, black ringed, bluish; reniform of the usual shape, moderate, black outlined with blue center; claviform outlined, small. Median shade black, heavily marked on costa, faint below where it runs near the posterior line. Median space narrow below median vein; the posterior line exserted opposite the cell and running inwardly inferiorly where it is followed by black and white venular points. Subterminal space smooth, concolorous, wide; terminal space narrow, shaded with pale, with a terminal black dotted line; subterminal line black, interrupted with pale, more even and equidistant from the margin than usual. Fringes fawn color, paler externally. Hind wings pale ochrey with rather broad blackish borders and faint discal mark; beneath pale with a dotted line within the border. Collar with black scales in front, and there are black scales on the tufts on dorsum and at the sides of the tegulæ. Eyes naked; tibiæ unarmed. Length of primary 13 mil. *Hab.* Colorado, Mr. Neumoegen.

Oncocnemis cibalis, n. s.

♂. Allied to *Chandleri*, but with the primaries more pointed, the collar whitish with a superior blackish line, the subterminal line preceded by a blackish shade which recalls *Polia illepida.* Eyes naked; tibiæ unarmed; fore tibiæ with a rather short claw. Gray, shaded with dusky; thorax pale gray. Fore wings gray with the veins marked; median vein and its two superior branches whitish. Orbicular elongate, white-ringed, fusing with the moderate, upright, blackish-centered, white-ringed reniform. Lines obliterate, indicated on costa by double fuscous streaks. A dusky streak from the base runs into the narrow white-outlined claviform. The jagged white subterminal line preceded by a blackish shading. Fringes with a pale line at base; interlined with fuscous. Hind wings whitish; with a discal lunule, vague external fuscous shading, and white, faintly interlined fringes. *Expanse* 33 mil. Colorado, Mr. Graef.

(To be Continued.)

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NOTES ON LYTTA (BLISTER-BEETLES).

BY E. W. CLAYPOLE, YELLOW SPRINGS, OHIO.

During the present summer three species of *Lytta* have been very abundant and destructive here. The Striped Blister-beetle *(Lytta vittata)* in the early part of the season, about the end of June, began to do mischief to the Potato plants, especially where they were weedy. Later on, about the middle of July, this species was joined by the White-edged Blister-beetle *(L. marginata)*, and both together fell upon the later kinds of Potato (in my garden the Buckeye). Now (August) the Black Blister-beetle *(L. atrata)* may be seen in company with the former two where a few belated plants afford them any green fodder. The last mentioned of the three, however, did not arrive in time to do any serious harm to the Potato, but turned its attention to a large bed of Sunflower belonging to my children, and are preying upon their yellow petals greedily. From twelve to twenty may be often seen upon a single plant.

All these three species "play 'possum" when frightened, but not all in the same way. The black one drops from the plant as does the Colorado Beetle *(D. 10-lineata)*, but does not fold in its legs and antennæ and roll about. It lies just where it falls for some seconds, with limbs in the position in which they were when it dropped. The white-edged and striped species fall as if struck dead, but always alight on their feet or gain them immediately, and stand looking warily about them. If no danger seems near, or if an attack is made upon them, they run, and having the longest legs of the group, they run fast and are difficult to catch. But their bodies being soft, they are easily crushed. Their juices, as their name implies, are exceedingly blistering, and soon raise a water blister on the skin if applied to it. Hence they are often used locally as a substitute for the Spanish Fly.

The presence and voracity of these Blister-beetles make it very difficult to keep a bed of potatoes clean by hand-picking of any kind, but of course Paris Green or London Purple is as destructive to them as to the

Colorado Beetle, and forms the best remedy. They are so wary that it is almost enough to clear the plants if one walks between the rows so that one's shadow falls on them. They may be seen dropping to the ground in a shower.

Though these three species are so abundant here, I have not seen a specimen of the fourth member of the group, the Ash-grey Blister-beetle *(L. cinerea)*, this summer, and a row of English Broad Windsor Beans which I planted as an experiment were quite untouched by them. The late Mr. Walsh says he never could grow these beans at Rock Island, Ill., because of the swarms of Ash-grey Blister-beetles which ate them up. My Broad beans were, however, badly injured by numbers of a small black hopping beetle, the name of which I do not know, but which treated their leaves exactly as the Turnip Flea Beetle treats the seed leaves of the young turnips. It was, however, much larger.

Not to paint the Black Blister-beetle any blacker than is just right, I must add that I not long ago found a swarm of them devouring the flowers of the great Rag-weed *(Ambrosia trifida)*. One of them, which I watched for some time, cleaned the whole of the flowers from one of the involucres of the raceme in a few seconds.

DESCRIPTION OF A NEW SPECIES OF LIMENITIS.

BY W. H. EDWARDS, COALBURGH, W. VA.

LIMENITIS EROS.

Allied to *Disippus*, wings less produced, and in female very broad.

MALE—Expands about 2.6 inch.

Upper side very dark red-brown; hind margins bordered broadly with black, costal margins narrowly; inner margin of primaries black to the submedian nervure; all nervures and branches black, and narrowly edged with same color; against the end of cell on primaries a long subtriangular black patch, its short side resting on costa, its apex prolonged into a stripe which reaches the border of hind margin below first branch of median; beyond the disk on secondaries a transverse curved narrow black stripe from margin to margin; within the borders and near their inner edges a

common series of white spots, which on secondaries are small and more or less obsolete ; on the black triangle three white spots in line, the two nearest costa large, the third minute ; a white spot at the origin of upper subcostal interspace and a white streak on outer side of costal nervure opposite the triangle and a little way toward base ; fringes black, white in the middle of each interspace.

Under side red-brown, nearly as dark as above, and of an uniform shade over both wings ; the apical area of primaries a little less red ; primaries have the spots on border repeated, enlarged and crescent-shaped, white, with purple scales about the edges, and half way to margin is another series of small purplish spots, one to each interspace ; at apex these are round, the rest abbreviated streaks ; the spots in the triangle repeated, as well as the markings next and on costa, all these pure white ; in middle of cell next subcostal a subtriangular white spot on black ground, and a white mark along same nervure nearer base.

Secondaries have the marginal spots repeated, much enlarged, crescent, and an obsolescent row of purplish crescents on middle of the border ; the black transverse stripe repeated and on *the inner side of same a crescent in each interspace, white, delicately tinted blue or purple.*

Female—Expands 3.2 to 3.4 inches.

Same color as male and similarly marked ; the black triangle shows a fourth spot ; in some examples the black cross stripe on upper side of secondaries has white crescents on inner side in the interspaces of anterior half the wing ; there is also a small white spot in cell of primaries next subcostal.

Under side like the male, but the white spots are greatly enlarged ; the crescents in borders almost serrated ; *the white crescents inside the stripe always conspicuous and sometimes very large,* exceeding indeed those of the border.

Several examples of this large and beautiful species were received by me last season from Indian River. It is allied to *Disippus,* from which it differs in the greater size of the female, in the very broad black borders in both sexes, in the depth of color, very nearly as dark as mahogany, above, and not much lighter below, and in the presence of white spots across the disk of secondaries, always on under side, and sometimes in ♀ on upper side also. My correspondent was able to obtain eggs by confining a female on willow, and these were forwarded to me in a tin box, and

though nine days on the road four larvæ reached me. One had just passed 2nd moult, one was swollen for 2nd moult, and two were in middle of second stage.

DESCRIPTION OF LARVA OF L. EROS.

Shortly before 2nd moult—Length .2 ; another .24 inch. Shape of *Disippus* at same stage, but the color red-brown, the sides darker ; the dorsal patch red-buff ; the processes on 3rd segment measuring .03 inch, stout at base, tapering to top, black, the knobs on their sides tawny.

After 2nd moult—Length .35 inch ; red-brown ; all the tubercles except those on the dorsal patch reddish, this patch yellow-buff ; the processes on 3 now .05 inch, black and as before.

After 3rd moult—Length .4 inch ; body very red ; the processes on 3 now .14 inch long, black, slender, bent forward at top ; many sharp thorns about the sides, and these as well as the stems are shining black, except the tips of the thorns, which are tawny ; the dorsal patch yellow-white. Duration of this stage 5 days.

After 4th moult (6 hours after)—Length .7 inch ; segments 2, 3, 4 red-tawny, clear colored, very little specked with black ; 5, 6, 7, 11, 12, 13 red-ferruginous, with little or no black ; the patch on 9, and partly covering 8 and 10, reddish-tawny ; the side stripe on basal ridge red-tawny, the processes on 3 vary from .2 to .26 inch long, slender, tapering regularly from base to top, their sides much covered with separated sharp spurs of irregular sizes ; the tips of these are tawny, but all else and the processes are shining black ; between these are two fine crested tuberculations, color of the ground ; on 4 are two large crests at the ends of the dorsal ridge, and two between these ; 5 has two small crests and three rows of red bead-like processes ; 6 has an elevated ridge with a mamilloid process at each end, the top crested ; the succeeding segments have but two dorsal tubercles to each, and to 11 they are small ; on the patch concolored ; 7 is beaded like 5, and 11 and 12 are much beaded ; 13 has two pairs of prominent processes, one quite at the extremity, and these are largest ; on 12 two large tapering processes crested at tops ; all crests are composed of little knobs like rice grains, and are red ; similar small crested tubercles on the sides, one row above, one below spiracles ; feet and legs red ; head obovoid, depressed at top, the vertices high ; color wholly red, except over mandibles across

the lower front, where it is reddish-black. Whole surface granulated and much covered with simple tubercles, roundly conical, and of irregular sizes ; around the top and down the sides at back of head a row of sharp and pretty long spurs ; all these red, as are nearly all in front, but a few are black both on front and sides ; on each vertex a stout black process, short, the top rounded, and at base of the arch are six little rounded elevations ; behind this process rises one of the spurs of the back head, overtopping it by .01 inch.

One day later, or 30 hours after the 4th moult, all the dark parts became paler, the red more brown, the face and head paler ; the crests of all the dorsal tubercles and those on sides quite white.

Still one day later, the red parts were changing to olive-brown, and the red beads had become blue. The next day the dark parts were entirely green, mottled light and dark, the dark being olivaceous. The processes on 3 had not at all changed color from the first.

Five days after 4th moult, the larva suspended, having reached a length of one inch, and two days later pupated.

Chrysalis—Length 1.1 inch ; head case sub-pyramidal ; the vertices have each a low elevation, triangular ; mesonotum high, rounded, with a thin low carina which rises to a blunt apex, sloping either way about equally ; wing cases much elevated above the surface on the dorsal and posterior sides, the middle being incurved ; on middle of dorsum rises a process, broad at base but rapidly narrowing to a sharp edge, rounded at top, not quite circular, the anterior part having a more rapid curve than the other ; the space between the base of this and the wing cases corrugated ; abdomen sub-cylindrical, a little compressed laterally, rising to a low medio-dorsal ridge ; color of anterior parts, head and mesonotum brown ; the dorsal side of head case imperfectly silvered ; wing cases deeper brown, the raised ridges blackish ; the dorsal process same color as the wings ; at base on either side is an oblique black bar which crosses three segments, and the space between these and the wing cases is silvered on a whitish ground ; abdomen buff, mottled with gray-green or olive-green, on ventral side covering quite uniformly, but on the rest the dark shades are faint and do not much discolor the light ; the last segments dark, like head. Duration of this stage 8 days. Two of the larvæ reached maturity and gave two female butterflies.

Eros differs as much from *Disippus* in its larval stages as it does in the imago.

Eros, after 1st moult—Color red-brown; processes on 3 are .03 inch long, tapering to top, black.

Disippus at same stage—Color mottled tawny and dark brown; processes on 3 are .01 inch long, made up of several elongated knobs, some white, some black.

After 2nd moult:

Color red-brown; processes .05 inch; black and tapering, with separated sharp spurs on sides.

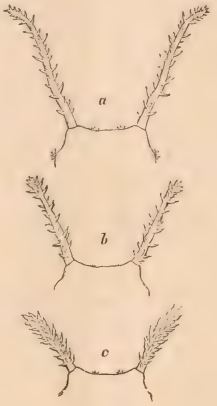

Fig. 24.

Color less tawny, much mixed with black; the processes thick, not tapering, but club shaped, wholly covered with knobs, mostly tawny, a little black.

After 3rd moult—Very red; the processes .14 inch long, black, slender, tapering, bent forward at top, scattered sharp spurs on sides, and except tips of these, all is shining black.

After 3rd summer moult—Color black, the tops of all tubercles tawny; processes .06 to .07 inch long, club-shaped as before, tawny.

After 4th moult—Color red-tawny and ferruginous, processes in color as before, .2 to .26 inch, slender, tapering to top, not at all clubbed, bent, always thinly clothed with acuminate spurs quite to top (fig. 24, *a*).

After 4th summer moult—Colors buff, black, red brown (but not red-ferruginous like *Eros*); processes tawny, sometimes mixed black, .12 to .22 inch, straight; the longer ones tapering for ¾ from base, then clubbed (fig. 24, *b*), the club thickly covered with fusiform knobs; the shorter ones club-shaped throughout (fig. 24, *c*) and thickly covered from base to top with fusiform knobs.

[The cut, by Mrs. Peart, shows the processes on 3rd segment of *Eros*, *a*, and of two mature *Disippus* bred at Coalburgh, 1880, *b*, *c*.]

Mrs. Peart made drawings of both *Eros* and Coalburgh *Disippus* larvæ, after 4th moult, and at same time, and writes me, that in addition to the remarkable difference in the processes on 3, the crests of the dorsal tubercles on *Eros* are composed of much larger grains and in greater number than in *Disippus*. She says: "The horns and the clusters of rice-grains, and the color of body are the chief points of difference."

Certainly a form which presents so conspicuous and permanent differences from *Disippus*, not only in the imago, but in the larval stages, is to be ranked as a distinct species.

I only know of *Eros* being taken in southern Florida, and it is the only form flying there so far as I know. Examples of *Disippus*, almost as dark as *Eros* on upper side,* come from northern Florida, and the Gulf States to Texas, but in these the under side of secondaries is but little darker than in many northern examples. (There is a strong contrast in *Disippus* in the color of the two wings below, secondaries being yellowish). Whereas in *Eros* both wings are of one red hue on under side, much like that of cherry wood.

On turning to the plate of *Disippus* in Boisduval and LeConte, which is taken from Abbot, I have little doubt that *Eros* furnished the examples from which the female represented was drawn. The shape is not that of the northern *Disippus*, as appears most decidedly by the figure of the under side, it being greatly broader, the fore wings less tapering, and so far this figure agrees with *Eros*. The colors are not deep enough for *Eros*, but apparently the under side is intended to be of an uniform shade. And inside the black cross stripe seem to be white crescents, very slight and half obscured by red paint in my copy, but they are dotted out by the engraver. In the text nothing is said of these crescents. The figure of the mature larva is roughly done, and can only represent the end of the stage after the colors have all changed, but the processes on 3 are very long and tapering, with separated spurs, and agree pretty well therefore with *Eros*. Boisduval refers to Fabricius, Ent. Syst. iii. 50 *(Misippus)*, which merely says: "alis repandis fulvis; margine nigro albo punctato, posticis arcu nigro," and this is understood to cover the northern *Disippus*.

* *Disippus* var a. *Floridensis* Strecker, Cat. p. 143. "The form found in Florida and other parts of the extreme South."

LIST OF SPECIES OF BUTTERFLIES RECEIVED FROM FORT NIOBRARA, NEBRASKA.

BY W. L. CARPENTER.

Pieris protodice, Bois.
Colias eurytheme, Bois.
Nathalis jole, Bois.
Argynnis cybele, Fabr.
" aphrodite, Fabr.
Euptoieta claudia, Cramer.
Phyciodes nycteis, Doubl.
" tharos, Drury.
Grapta interrogationis, Fab.
" comma, dryas, Edw.
" progne, Cramer.
Limenitis Weidemeyerii, Edw.
Apatura celtis, Bois.
Debis portlandia, Fab.
Satyrus nephele, olympus, Edw.
Neonympha eurytris, Fabr.
Thecla strigosa, Harr.
" calanus, Hubn.
Lycaena comyntas, Godt.
" neglecta, Edw.
Pamphila zabulon, Bois.
" manataaqua, Scud.
" huron, Edw.
Pyrgus tessellata, Scud.
Eudamus bathyllus, Sm.-Abbot.
" tityrus, Fabr.

ON "THE WHITE SCALE OF THE ORANGE."

(Ceroplastes rusci Linn.)

BY WM. H. ASHMEAD, JACKSONVILLE, FLORIDA.

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This is another scale found by me infesting the orange trees in Florida. It has a wide distribution, being found in Europe, Australia and the southern parts of America.

Like the Long Scale *(Aspidiotus Gloverii)*, it has probably been imported into this country, and but recently, as I can find no record of its having been found in Florida several years back. It is now just beginning to become common.

ITS FOOD PLANT.

M. Signoret, "Essai sur le Cochinelles," gives its food plants in Europe as the myrtle, common holly and wormwood. In Florida I have found it on the myrtle, orange, fig and oleander. Prof. J. H. Comstock, on his recent tour to Florida, told me he had found it also on the gall-berry *(Ilex glaber.)*

The Scale, fig. 25, when fully matured, averages from .10 to .14 of an inch in length, by from .06 to .08 in width, and is highly arched. On the top it is tesselated with seven well-defined, oval, elevated checkers, three on each side, nearly round, the seventh, at posterior end, being more or less triangular. At first, the color is whitish, resembling wax, with which it is similar in consistency, being soft and pliable. As it reaches maturity it becomes pinkish with a slight yellowish tint in depressions; just before the young hatch, it becomes of a globular form, and the top changes to a dark brown.

Fig. 25.

The summer-brood of young hatch in from ten to twenty days after the eggs have been laid. The female is flattened, oval, resembling in shape the wood-louse, only not so convex. It is pale yellowish, with a brownish tint on back; antennæ six-jointed; in the posterior end is a deep triangular-shaped indentation, from the centre of which protrudes a fleshy tubercle, reaching to outer edge, and from each corner of the notch on either side of the tubercles issues a long filament nearly as long as the insect, with a short hair on each side.

These crawl round for two or three days after hatching, searching for a suitable place to insert their beak. After inserting their beak they become stationary, and there soon after begins to form over them a waxy secretion in the form of small white globules, which is quite plainly visible in a few days in the form of small, white, round, elevated spots surround-

ing the insect, particularly just above the spiracles. As it increases in size, the limbs, which are of no more use, gradually disappear, and on reaching maturity it forms a brownish pupa, which on cutting open is found filled with eggs. These are elliptical, .01 of an inch in length, and of a pale yellow color. In one of the cases I counted one hundred and five eggs.

NUMBER OF BROODS.

During the year there are three broods ; the first brood hatches from last of April to middle of May ; the second, from middle of July to first week in August ; the third, from last week of August to middle of September. One can form some idea of their prolificness, by supposing nothing prevents the first hundred eggs from hatching ; this would give one hundred insects, which in turn produce their one hundred eggs, making in all 10,000 by second brood ; these each producing a hundred would give a grand total of 1,000,000. One million—think of it—the produce of one scale insect in a year !

Thanks, however, to that immutable law which governs the universe, it has its enemies to prey upon and keep it from increasing too fast.

NATURAL ENEMIES.

The twice-stabbed Lady-bug *Chilocorus bivulnerus*, the blood-red Lady-bug *Cycloneda sanguinea*, and an ichneumon fly, are its principal foes. I have also detected a small white mite, about $\frac{1}{100}$ of an inch long, among the eggs and old scales ; but whether it be an enemy or not I cannot say, as I have failed to detect it doing any damage. I'm inclined to think it merely feeds upon the decaying matter of the old scale.

I have not not yet met with the male of this species, but hope to do so before long.

The cut will give an admirable idea of the scale.

NORTH AMERICAN MOTHS.

BY A. R. GROTE.

(Continued from Page 244.)

Oncocnemis levis, n. s.

Primaries much shaded with black over dusty ochrey. Markings fine, neat, distinct. The lines black, with narrow included dusty ochrey shades. Half-line present. Anterior line with three dentations. Claviform long,

reaching to posterior line, having a pale dusty ochre annulus edged outwardly with black, brown interiorly. Orbicular moderate, round, a little oblique with an interior brown annulet. Reniform upright lunate, pale dusty ochre, with an interior brown curved shade divided by a whitish hair-line on the cross vein. Posterior line curved, running inwardly below median vein, but not abruptly. The subterminal space is shaded with dusty ochre beyond the line. Subterminal line preceded by distinct long interspaceal black dashes. Terminal space narrow, shaded with black. A black terminal line; fringes pale at base, interlined. Hind wings dusty ochrey fuscous with distinct wide black borders; veins soiled with fuscous; beneath paler with traces of a mesial line and the black border repeated. On fore wings the black border is less vivid and there are blackish shadings on the cell and traces of an extra mesial line. Thorax and head colored like primaries; collar with a fine line in front, and double lines above. Fore tibiæ with a terminal spine and a shorter one opposite; eyes naked. Length of primary 15 mil. *Hab.* Colorado, Mr. Neumoegen; several examples.

This species approaches *augustus* in ornamentation; the band on secondaries is broader and their color is darker, being ochrey fuscous, while in *augustus* they are whitish. The long black interspaceal dashes before the subterminal line are wanting in the Texan species, in which the claviform is vague and the orbicular spherical.

Since my first discovery of this interesting genus in North America it has been enriched by many species. In the European Catalogues four species are enumerated from the Altai and Ural regions. The following is a list of our species with localities:

Genus Oncocnemis Led.

Hind wings yellow.

1. *Hayesi* Grote, Bull. B. S. N. S. 1, 105, pl. 3, fig. 13. Colorado.
2. *Dayi* Grote, Bull. B. S. N. S. 1, 105, pl. 3, fig. 8. Colorado.
3. *mirificalis* Grote, Bull. U. S. Geol. Surv. 5, 207. Nevada.

Hind wings soiled whitish or fuscous.

4. *levis* Grote, n. s. Colorado.
5. *Augustus* Harvey, Bull. B. S. 3, 73, pl. 3, fig. 5. Texas.
6. *Behrensi* Grote, Bull. B. S. N. S. 2, 65. California, in February.
7. *Glennyi* Grote, Bull. B. S. N. S. 1, 141, pl. 4, fig. 17. Colorado, in July.

8. *cibalis* Grote, n. s. Colorado.
9. *homogena* Grote, Bull. U. S. Geol. Surv. 3, 800. Colorado, Nevada.
10. *oblita* Grote, Bull. U. S. Geol. Surv. 3, 117. Nevada.
11. *Meadiana* Morrison, Proc. A. N. S. Phil. 1875, 60. Colorado.
12. *Chandleri* Grote, Bull. B. S. N. S. 1, 107, pl. 3, fig. 9; id. 3, 87; Bull. U. S. Geol. Surv. 3, 117. Colorado.
var. *riparia* Morr., Can. Ent. 7, 213. Long Island; Buffalo, N. Y.
13. *atricollaris* Harvey, Bull. B. S. N. S. 2, 273; id. 3, 73. Texas, Arizona.
14. *Saundersiana* Grote, Can. Ent. 8, 29. Canada.
15. *occata* Grote, Trans. Am. Ent. Soc. 5, 114; Bull. B. S. N. S. 3, 77, 87, pl. 2, fig. 6. Texas; California.

Hind wings black.

16. *aterrima* Grote, Can. Ent., 11, 199. California.

Of these sixteen species I have not been able to carefully examine *Meadiana*, the type of which is in Mr. Tepper's collection. It seemed to me different from any of the others, although the specimen is not in fine condition. *O. aterrima* is aberrant in color and appearance; *Behrensi* is allied to the European *confusa; atricollaris* looks like a *Homohadena*, as which it was originally described. The variety of *Chandleri* which I have collected near Buffalo, and which is called *riparia* by Mr. Morrison, does not differ by the hind wings, but may be recognized by the paler gray primaries and the white marked subterminal line; the terminal black interspaceal dashes are also wanting. My single (♀) Buffalo specimen now before me is more aberrant from *Chandleri* than Mr. Morrison's type of *riparia*, or another Buffalo specimen collected by Miss Walker, to which I have alluded Bull. U. S. Geol. Surv. 3, 117. More material is evidently needed to decide on the value of *riparia*, which is our only Eastern example of the genus.

Homohadena chorda, n. s.

Fuscous gray. Front and palpi pale; fore wings shaded with pale gray over the median space inwardly obliquely, and beyond the posterior line narrowly and irregularly. Half-line present. Anterior line rather thick, arcuate, a little uneven. Reniform vague, small and pale. Posterior line narrower than anterior, a little uneven, nearly straight, not as much inflected as usual. Subterminal line preceded by a diffuse black shading. Terminal space fuscous. Median shade indicated by a black

costal spot, below which it is thread-like, hardly noticeable. Hind wings whitish with broad black borders, veins soiled; beneath with black border, within which indications of a narrow mesial line. Collar and thorax concolorous fuscous gray. Vertex between the antennæ black. Length of primary 15 mil. *Hab.* Colorado.

Homohadena fortis, n. s.

Thorax smoothly haired; abdomen untufted. Size large. Of a dusty fuscous, paler than *incomitata*. Basal dash obsolete; no dash on median space. Median lines accentuated on the veins, very narrow, black and single. Anterior line perpendicular. Posterior line with a rather long and narrow extension beyond the disc; lunulate between the veins, which are marked with black points. A succession of pale marks preceded by very slight black dashes indicates the subterminal line. A row of terminal black points. Fringes shaded, paler than the wing. Hind wings white, sub-pellucid; the nervules soiled; a vague terminal fuscous shading; fringes whitish. Head and collar darker shaded than the thorax, dusky fuscous. Stigmata indicated by paler shading; orbicular ovate, elongate; reniform moderate, upright; claviform indicated. *Expanse* 40 mil. *Hab.* Nevada.

Homohadena picina, n. s.

Thorax and primaries unicolorous dusky fuscous; the median lines indicated by venular dots, incomplete; the posterior line not as flexed as usual; fringes concolorous. Hind wings whitish at base, washed with fuscous exteriorly, the veins soiled; faint traces of a mesial line. Beneath the secondaries are paler, with a distinct dotted line. Eyes naked; body untufted; tibiæ unarmed. A stout, obscurely colored and simply marked form. *Expanse* 40 mil. California, Mr. Hy. Edwards, No. 7174.

The genus *Homohadena* has the facies and untufted body of *Oncocnemis*, but differs by the absence of the tibial claw. Our species are as follows:

HOMOHADENA Grote.

Type: H. badistriga.

1. *atrifasciata* Morrison, Proc. A. N. S. Phil. 1875, 431; Grote, Can. Ent. 10, 234. Maine; Northern N. Y.
2. *chorda* Grote, n. s. Colorado.
3. *badistriga* Grote, Bull. B. S. N. S. 1, 181; Check List 1, pl. 1, fig. 5; Lintner Ent. Contrib. 4, 93 *(larva)*. Middle States.

4. *kappa* Grote, Trans. Am. Ent. Soc. 92, Sept., 1874; *? retroversa* Morr., Proc. Bost. S. N. H., 157, Dec. 1874. Kansas; Mo.; Texas.
5. *figurata* Harvey, Can. Ent. 7, 117. California.
6. *induta* Harvey, Bull. B. S. N. S. 2, 274. Texas.
7. *incomitata* Harvey, Can. Ent. 7, 136; id. Bull. B. S. N. S. 3, 6. Texas.
8. *fortis* Grote, n. s. Nevada.
9. *picina* Grote, n. s. California.

Charadra palata, n. s.

♂. Eyes hairy; antennæ bipectinate, testaceous. Gray; black and white. Aspect of a *Raphia*. Anterior line black, widely outwardly bent, irregularly arcuate. A black median shade line; a black dash on submedian space connecting the oblique propinquitous median lines. Stigmata whitish, black-ringed with central dot and streak; sub-equal. Subterminal line sinuate, black, indented opposite the cell, followed by a white shade. Hind wings pure white with the fringes. Thorax gray. Ocelli present. *Expanse* 38 mil. Colorado.

Slighter than the other species and differing decidedly by the more even and oblique transverse lines.

Our four species of *Charadra* Walk., a North American genus allied to the European *Trichosea ludifica*, differing by the pectinate antennæ of the male, the longer palpi, the ornamentation and color, may be catalogued as follows: *deridens* Guen.; *dispulsa* Morr.; *palata* Grote; *propinquilinea* Grote. No species are known from California; Mr. Morrison's *decora* is Central American, its given locality incorrect; it may be the *Diphthera cavillator* of the British Museum Lists.

ENTOMOLOGY FOR BEGINNERS.

Some Fungi-Eaters.

BY W. HAGUE HARRINGTON, OTTAWA, ONT.

It is related by a celebrated traveller and naturalist that, in the dreary islands of Terra del Fuego, the only vegetable food to be obtained by the wretched inhabitants, with the exception of a few berries, is a fungus which grows in great abundance on certain trees. This fungus appears

on the bark in the shape of bright yellow, globular masses of the size of small apples, and at a certain stage of development is gathered and eaten uncooked. Other savage tribes inhabiting barren territories may be partially dependent on similar substitutes for the nutritious roots and succulent fruits used by more favorably located races; but civilized man, with his long list of food plants to choose from, considers fungi more as luxuries than as essential articles of diet.

The common field Mushroom (*Agaricus campestris*), found wild throughout the greater part of the world, ranks high as a table delicacy, and is largely cultivated in some countries. Several other species of fungi are also used in considerable quantities; for instance, the famous Truffle, which grows several inches below the surface of the ground, and requires to be hunted with the aid of dogs trained to scent them out. Many others, likewise very wholesome and palatable, are, however, seldom used because of their resemblance to poisonous varieties.

We find man not alone in his liking for fungi and his use of them as food. Domestic cattle and many wild animals also relish them and devour species shunned by man. The insect world produces a great variety of species subsisting either in the larval or perfect state, or in both, upon fungus. Often when a fine, fresh-looking, pink-gilled, snowy-clad Mushroom is plucked, the picker finds, much to his disappointment and disgust, that his savory morsel is already "food for worms." A number of small grubs are feasting within the stalk, and in a few hours the cherished Mushroom becomes a black decaying mass, filled with little maggots.

A great variety of fungi are similarly attacked and made the banqueting chambers of numerous foes. The tender, short-lived species, such as Mushrooms and Toadstools, decay and perish quickly, but the harder kinds, growing upon old and dead or fallen trees, harbor their tenants much longer, and preserve their shape and outward comeliness even after they have been eaten and withered away inwardly.

The object of this brief paper is to call the attention of any who have recently commenced collecting to the fact that fungi are so much frequented by insects, and that many species can be obtained from them with but little trouble. I will therefore briefly mention a few of the numerous Coleoptera which I have taken on or in fungus; not because they are rare beetles, but rather because they may be easily obtained and are well known.

Megalodacne heros is the finest beetle which I have found feeding upon fungus. It belongs to the Erotylidæ, a family known by the large antennal club, formed by an enlargement and flattening of the three last joints. This family is said to be largely developed in tropical America, where its members are mostly leaf-eating beetles, differing in this respect from northern species which live upon fungi. One day last summer (9th June) I met with a number of large chocolate-colored fungi growing upon the roots and bark of the stumps of some large Hemlocks recently felled. Hiding in crevices of the bark, or in the damp chips and leaves from amidst which the fungi on the roots were springing, I discovered numerous specimens of this handsome beetle and collected about thirty, which had been recently feeding upon the fungus, as evidenced by the holes gnawed therein.

The beetles varied much in size, being from four to seven-eighths of an inch long. They are of an elongated oval shape, three times as long as broad. The head, bearing the distinguishing club-tipped antennæ, is inserted to the eyes in the almost square thorax. The beetle is broadest across the base of the elytra, which taper gradually and are rounded off at the tip. Each elytron is marked by two orange patches; the one at the base is somewhat in the form of a Maltese cross with the lower arm broken off, but varies in different specimens; the other is an irregular band about one-third the distance from the tip. With these exceptions the beetle is of a jet black, highly polished, and is a handsome insect. About six weeks later I visited the same locality in the expectation of obtaining some more of these fine beetles, but could find none. In some fresh fungi of the same kind I found numbers of large stout grubs, from one-half to over three-quarters of an inch long, with a broad black band across the top of each segment. They were probably the larvæ of this beetle, but as I did not succeed in rearing any of those I took, and could not visit the place again, they may have been those of some fungi-eating Tenebrio, to some larvæ of which family they had much resemblance.

From the same fungi from which I had previously taken the above-mentioned beetles, and which were now hard and dry, I obtained nearly forty specimens of *Bolitotherus cornutus*, the majority females. This beetle belongs (with the two species next to be described) to the Tenebrionidæ, the members of which family live chiefly in or about dead stumps and logs, hiding in crevices or under bark, fungus and moss. It is a dark brown or dull black beetle, thickly covered with tubercles, so

that it looks like a bit of rotten bark or dry earth and easily escapes detection when it drops to the ground with its legs tightly folded. The male has two horn-like projections upon the thorax and also two minute ones on the front of his head. Those on the thorax are more than an eighth of an inch long, flattened inwardly at the end and fringed with a light pubescence. The beetles are found abundantly during the summer and autumn, feeding upon the large woody fungi which spring from stumps and decaying trees. While the beetles are found imbedded in holes gnawed in the surface, the larvæ in different stages will be obtained by breaking apart the fungus, in which they burrow out cells until the whole mass is full of holes and tunnels filled with excrement. The grubs are long and cylindrical, attaining when full grown a length of three-quarters of an inch, and have two spines on the last segment, as have the larvae of many species of this family.

Diaperis hydni is a small stout beetle, a quarter of an inch long, common in fungus growing upon old and decaying Beech trees (such as are infested by *Dicera divaricata* and *Tremex columba*). It is very smooth and glossy, and is jet black with the exception of the elytra. These are light brown and are marked by two small black dots just behind the thorax and by two larger ones midway between these and the tip. They are also ornamented by lines of minute punctures, hardly visible to the naked eye, and not interrupting the glistening appearance of the beetle.

Hoplocephala bicornis is a little dark greenish beetle, found in great numbers in the dry leathery fungus which grows, like overlapping scales, on hardwood stumps. Although this beetle is less than one-fifth of an inch long, the male may be easily distinguished by the two little spines or horns which he bears on his head, and from which the species derives its name. They soon reduce the dry fungus to a white powdery state.

Mycetophagus punctatus is abundant in the fresh, soft, white fungi which grow from the bark of various trees, not in compact masses, but laminated or gilled beneath like Toadstools. On giving the tree a smart tap the beetles will shower down from between the gills upon a beating net held below. They are nearly one-fourth of an inch long, and are black, except the yellowish elytra, which are marked by a black spot surrounding the scutel, a black band across near the tip and two black spots midway between this band and the thorax. Associated with them are generally found numbers of a smaller but very similarly colored species, *M. flexuosus*.

Similar fungi will sometimes be found to contain a great many very slender little white grubs, with a black head no larger than a pin hole. I have seen them twisted together in such lumps that the black heads seemed like some tiny mites creeping about over the wriggling mass, in which the respective bodies were lost. These are the larvae of *Triplax thoracica*, a reddish beetle, one-fifth of an inch long, with blue-black elytra, belonging, like the first beetle described, to the Erotylidae.

Penthe obliquata is a very active beetle which scampers hastily away when disturbed at its fungus feast or in its hiding place under bark, and thus frequently eludes its discoverer. It is of a deep dull black, only relieved by the reddish yellow scutel and a yellow apical joint to the antennae. The elytra are very densely and irregularly punctured. This fine beetle is half an inch long and almost oval in shape. A rarer and slightly larger, but not so handsome insect, is *P. pimelia*, which I have found under the bark of old trees. It is of a dull brownish black, and has the elytra more evenly and less densely punctured. As it lacks the yellow scutel, it is easily distinguished from the preceding species.

Many Staphylinidae are found in the stalks of Toadstools and in other fungi, while those of many other families resort to these productions either for an occasional meal or for a life-long diet. Such are *Cratoparis lunatus* among the Weevils, and *Onthophagus hecate* of the Scarabeans. To even enumerate these would require much space, but I think I have already written enough to show that the young collector will find it profitable to search the different fungi for specimens, especially early and late in the year, when other feeding grounds are unproductive. I might add that many insects in turn fall victims to fungi. The house-fly is a familiar instance of this, and every fall we see great numbers of them stick to our walls and windows, their bodies distended by the fungus, which also spreads some distance around them.

Correction.—I desire to correct an error in my late Annual Address to the Entomological Society of Ontario, to which my attention has been called by Prof. C. V. Riley, in reference to the larval habits of the black blistering beetle, *Epicauta pennsylvanica*. On page 196, Can. Ent., I stated that "the larva of this insect is found only in the nests of bees, wasps, &c., where it feeds on the young of these nest-making insects."

This was, I believe, until a comparatively recent period the view universally held by Entomologists. In the First Annual Report of the U. S. Ent. Com. relating to the Rocky Mountain Locust, published in 1878, Mr. Riley states that he has found the larva of this species, *E. pennsylvanica*, along with those of other species of the same genus, feeding on the egg masses of the Rocky Mountain Locust, *Caloptenus spretus*, and has bred the perfect insect therefrom. This statement had escaped my notice. WM. SAUNDERS.

CORRESPONDENCE.

DR. HAGEN'S MYSTERY.

DEAR SIR,—

My writings on *Pronuba yuccasella* have induced considerable discussion and comment, both from horticulturists and entomologists. Many of the criticisms of my conclusions are unworthy of notice and have not been noticed by me; but the note from Dr. Hagen in your July number cannot be passed in silence. Just as I had, in the June and July numbers of the *American Entomologist*, dispelled much of the "mystery" regarding this little moth and shown that the conflicting experiences were due to the confounding, by my critics, of another species *(Prodoxus decipiens)* with it, Dr. Hagen increases the "mystery" by his statements in the note referred to. His statements are positive and circumspect, but I am as fully satisfied that he has in some way made a mistake as I am that others have been mistaken who wrote with equal assurance on the subject of *Pronuba*. I have obtained in all from the stems of Yucca some forty specimens of *Prodoxus*, none of them showing any sign of the maxillary tentacle of *Pronuba*, and it would be strange indeed if Dr. Hagen's two individuals formed such a remarkable exception. I write this upon first reading his note, but as I expect shortly to have the privilege of examining the specimens, I will wait and see what light I can then throw upon this last "mystery."

Regarding Dr. Hagen's unwillingness to send me a specimen of the Yucca stem larva, I have simply to say that upon learning from Mr. Thomas Meehan that he had sent to Dr. Hagen what, from my previous experience with it, I thought was probably *Prodoxus decipiens*, I greatly

desired to ascertain whether it was so or whether my friend was right in considering it Coleopterous—the determination being important in the light of previous published statements by Mr. Meehan. I do not see how the gratification of my desire would have in any way interfered with Dr. Hagen's intended publication, and when, after sending him a *Prodoxus* larva and asking him to tell me whether his was identical or different, no reply came, I was forced to seek the information elsewhere. Mr. Meehan kindly sent me some infested stems from the same lot as those sent to Dr. Hagen, and from them I at once recognized *Prodoxus*, and from them even bred the moths, *which did not have the characters of Pronuba.* C. V. RILEY.

Washington, D. C., Aug. 16, 1880.

P. S.—As a post script to what I have previously written regarding Dr. Hagen's note on *Pronuba yuccasella*, I wish to say that upon meeting him he at once admitted his error, and I leave him to explain it.

Boston, Mass., Aug. 23, 1880. C. V. R.

I have to note the capture of *Hadena confederata* Gr. on Staten Island in October. This species I have originally described from Louisiana and Texas. My friend, Mr. Thaxter, has taken it also at the same time in Cambridge, Mass. It is a Southern form, coming northward in the fall. Mr. Thaxter caught it in Jamaica, N. S. Mr. Thaxter has also bred the *Spanish Moth*, *Euthisanotia timais*, in Florida. A. R. GROTE.

During August I had a three weeks' hunt about Ridgeway, and a finer place for the purpose I have never been in. I brought home one Catocala new to me, small size. One day I saw a little beauty sitting on a tree, which I took for a Catocala, but it is *Ephesia clonympha*, a perfect gem in its way. We came across three butterflies I never saw alive before: *Papilio marcellus*, *P. philenor* and *Junonia coenia*. We took but one of each; also one specimen of *cresphontes*. Some fine flies taken on the lake shore; beautiful specimens of the banded *Midas*, and a large red one I had not seen before.

The sand seemed full of the larvae of the Ant Lion, but it was too early for the mature insect. I took one specimen of *Myrmelion abdominalis* at Long Point, and one of a species I don't know.

Hamilton, Aug. 10, 1880. J. ALSTON MOFFAT.

INDEX TO VOLUME XII.

Acidalia enucleata, 236.
Actinota derupta, 186.
Acridii, notes on American, 75.
Adela coruscifasciella, 225.
" Ridingsella, 225.
" Schlægeri, 225.
" trifasciella, 225.
" trigrapha, 225.
Aedia fascicolaris, 118.
Agnomonia quadrifilaris, 118.
" sequistriaris, 117.
Agraulis vanillæ, preparatory stages of, 141.
Agrotis Baileyana, 186.
" catherina, 187.
" *citricolor, n. s.*, 154.
" *hilaris, n. s.*, 153.
" innotabilis, 154.
" lubricans, notes on larva of, 14.
" manifestolabes, 187.
" perquiritata, 185.
" personata, 187.
" *stellaris, n. s.*, 153.
Aletia argillacea. 117, 173, 211.
Alypia Maccullochii, 41.
American currant borer, 5.
Amphion nessus, 231.
Anabrus Haldemanii, 223.
" simplex, 223.
Anarta nivaria, 186.
Anisota rubicunda, 212.
Annual Report Ent. Soc. Ont., 35.
Anomis erosa, 116.
Anthomyia radicum, 212.
Anticarsia gemmatilis, 87.
Argynnis alcestis, preparatory stages of, 69.
" aphrodite, 144.
" atlantis, 74.
" cybele, 73.
" preparatory stages of, 141.
" diana, 73, 144
Argyrogramma omega, 117.
Arsilonche Henrici, larva of, 45.
Ashmead, Wm. H., article by, 252.
Attacus luna, 194, 227.
Auchmis confusa, 118,

Bates, J. E., article by, 20.
Bees, interesting facts relating to, 168.
Bethune, Rev. C. J. S., articles by, 101, 161.
Birds, insectivorous, 189.
Biston *virginarius, n. s.*, 220.
Blister beetles. notes on a few American, 227.
Bolistotherus cornutus, 260.
Bombyces, notes on some American, 227.
Bostrichus bicornis, 107.
Botis *dissectalis, n. s.*, 36.
" *opilalis, n. s.*, 36.
" *oscitalis, n. s.*, 36.
" penitalis, larva of, 45.
Bowles, G. J., articles by, 130, 146.
Brachycentrus fuliginosus, 108.
Bradynotes, n. g., 76.
Brotis vulneraria, 116.
Bruchus pisi, 194.
Butterflies captured near Boston, 100.
" " at Fort Niobrara, Nebraska, 252
" " in Illinois, 46.
" " in Portland, Me., 7.
" " at Yellow Springs, Ohio, 120.
" mouth organs of, 172.
" scarcity of in New Brunswick, 19.

Caloptenus femur-rubrum, 133
" spretus, 131.
Calosoma calidum, 34.
" scrutator, 35.
Calpe canadensis, larva of, 44.
Caradrina bilunata, 187.
" meralis, 187.
Carpenter, W. L., article by, 252.
Catocalas, early appearance of, 137.
Catocala hunting, 241.
" ultronia, 4.
Ceramica rubefacta, 185.
Ceratomia quadricornis, 212.
Cerma cora, 86.
Ceroplastes rusci, 252.
Chalcid, a new silk-spinning, 158.
Chambers, V. T., article by, 225.
Charadra *palata, n. s.*, 258.
Cheese mite, 239.
Chilo *cramboides, n. s.*, 15.
Chrysophanus thoe, 230.
Chytolita morbidalis, larva of, 44.
" *petrealis, n. s.*, 219.
Cicindela 12-guttata, 65.
" generosa, 65.
" hirticollis, 65.
" punctulata, 65.
" purpurea, 63.
" sexguttata, 64.
" vulgaris, 63.
Clavpole, E. W., articles by, 120, 245.
Cleophana antipoda, 217.
Clisiocampa sylvatica, 196.
Clytus pictus, 150.
" Robiniæ, 151.
" speciosus, 149.
Coleoptera for beginners, 138.
" from Hickory twigs, 169.
Colorado potato beetle, 173.
Contributions to Coll. Ent. Soc., 55.
Conotrachelus nenuphar, 194.
Coquillett, D. W., article by, 41.
Cordyceps ravenelli, on col. larvæ, 89.
Correction, 80, 147, 262.
Correspondence, 19, 37, 59, 80, 99, 119, 140, 160, 263.
Cossus centerensis, 59.
" larva of, 39, 100.
Couper, Wm., article by, 41.
Crambus *anceps, n. s.*, 18.
" *attenuatus, n. s.*, 18.
" conchellus, 15.

Crambus *dissectus*, *n. s.*, 16.
" *duplicatus*, *n. s.*, 79.
" *edonis*, *n. s.*, 19.
" *exesus*, *n. s.*, 10.
" fuscicostellus, 18.
" *Goodellianus*, *n. s.*, 17.
" hastiferellus, 16.
" hortuellus, 15.
" inornatellus, 80.
" interruptus, 15.
" *lacinellus*, *n. s.*, 18.
" Leachellus. 16.
" myellus, 15.
" *occidentalis*, *n. s.*, 16.
" *oregonicus*, *n. s.*, 17.
" *repandus*, *n. s.*, 79.
" topiarius, 15, 17.
" vulvivagellus, 17.
" list of N. Am. species, 77
Cratoparis lunatus, 2, 62.
Cratypedes putnami, 223.
Crociphora flavistriaria, 118.
Currant borer, American, 5.
" " imported, 5.
Cut-worms 189.

Danais archippus, swarming of, 37, 38, 119, 134.
Darapsa versicolor, 211.
Deilephila lineata, 231.
Diaperis hydni, 261.
Dicerca divaricata, 261.
Dinoderus punctatus, 107.
Dorytomus mucidus, 106.
Drasteria cuspidea, 86.
" graphica, 85.
Drepanodes Fernaldi, 219.
Dryobius sexfasciatus, 139.

Eburia quadrigeminata, 107.
Edwardsia brilliens, *n. s.*, 68.
Edwards, W. H., articles by, 9, 21, 51, 69, 90, 109, 122, 141, 160, 224, 231, 246.
Egeria tipuliformis, 5.
Elaphria grata, 86.
Entomological Club, A. A. A. S., Annual Meeting of, 104, 140, 161.
" " " Annual Address of President, 161.
" notes, 106.
" Society of Ontario, Annual Meeting of, 157, 210.
" " " Annual Address of President, 189.
Entomology for beginners, 4, 32, 56, 61, 95, 101, 130, 148, 237, 258.
Ephemeridæ, early stages of, 40.
Ephesia amica, 86.
" elonympha, 85, 264.
Epicauta convolvuli, 107.
" pennsylvanica, 262.
Epizeuxis lituralis, 85.
Erebus odora, 211.
Eros coccinatus, 107.
Euchaetes collaris, 228.
" egle, 230.
Eucrostis chloroleucaria, larva of, 235.
Eudryas unio, 231.
Euhalisidota *longa*, *n. s.*, 213.
Eulepidotus alabastraria, 116.
Eunetis ultronia, 116.

Eupelmus *floridanus*, *n. s.*, 209.
" mirabilis, 209.
" *reduvii*, *n. s.*, 207.
Euplectrus albiventris, 158.
" *Comstocki*, *n. s.*, 159.
Euptoieta claudia, preparatory stages of, 231.
Eustrotia mariæ, 186.
" secta, neuration of, 50.
Euthisanotia timais, 118, 264.
Eutrapela transversata, 236.

Fireflies, 169.
Fish, Chas., article by, 239.
Fitch, late Dr., collection of, 66.
Fletcher, James, articles by, 1, 32, 60, 160.
Forest tent caterpillar, 196.
French, G. H., articles by, 14, 42, 83, 140, 241.
Fungi-eaters, 258.

Galls, hymenopterous, 170.
Gibbes, Lewis R., article by, 60.
Golden-rod plume moth, larval habits of, 105.
Grape-vine flea beetle, 196.
Graphiphora contrahens, 186.
Grapta progne, preparatory stages of, 9.
Grote, A. R., articles by, 15, 36, 50, 57, 77, 80, 84, 88, 116, 152, 184, 213, 254, 264.
Gunther, Otto R., death of, 99.

Hadena *adnixa*, *n. s.*, 243.
" *characta*, *n. s.*, 243.
" chryselectra, 244.
" confederata, 264.
" crocea, 215.
" *cylindrica*, *n. s.*, 214.
" norma, 186.
" *singula*, *n. s.*, 215.
" *tonsa*, *n. s.*, 214.
Hagen, Dr. H. A., articles by, 81, 89, 108, 121, 128, 197
Haldeman, Prof. S. S., death of, 220.
Harrington, W. H , articles by, 95, 258.
Hemaris marginalis, 231.
Hemeroplanis pyralis, 87.
Hessian Fly, 171, 197.
Heterocampa pulverea, larva of, 83.
Heustis Caroline E., article by, 19.
Hippiscus lineatus, 223.
Homohadena *choridia*, *n. s.*, 256.
" list of species of, 257.
" *fortis*, *n. s.*, 257.
" *picina*, *n. s.*, 257.
Honey ants, 168, 170.
Hoplocephala bicornis, 261.
Howard, L. O., articles by, 158, 207.
Hypena scabra, larva of, 43.
Hypoprepia fucosa, larva of, 45.
Hypsoropha hormos, 85.
" monilis, 85.

Ichneumonidæ, new species of, 42.
Insects, fossil, 168.
" fungoid diseases of, 126.
" parasitic, 193.

Jewett, H. S., article by, 228.
Jodia rufago, 86.
Johnson, James S., article by, 137.
Junonia cœnia, 211–264.

Kellicott, D. S., articles by, 59, 105.

Lampyridæ, 174.
Larvæ, wood-boring, 60.
" on describing, 108.
Leconte, Dr. John L., articles by, 126, 174.
Leucania albilinea, 116.
Libythea Bachmani, 211.
Lightning bugs, 174.
Limenitis *eros*, *n. s.*, 246.
Lithacodia bellicula, 86.
" penita, 186.
Lithophane *contenta*, *n. s* , 216.
Locust, the, 130.
Luceria loculata, 185.
Lycaena, a bi-formed, 160.
Lycoperdina ferruginea, 139.
Lyman, H. H., article by, 7.
Lytta atrata, 245.
" cinerea, 246.
" marginata, 245.
" vittata, 245.

Macrocentrus *iridescens*, *n. s* , 43.
Macrodactylus subspinosus, 196.
Mamestra *acutipennis*, *n. s.*, 214.
" curta, 186.
" *aefessa*, *n. s*, 88.
" thecata, 186.
McBride, A. S., article by, 106.
Megalodacne heros, 260.
Melicleptria tuberculum, 118.
Melipotis jucunda, 86.
Melitaea phaeton, 160.
Microgaster *utilis*, *n. s.*, 42.
Migration of butterflies, 39.
Migratory insects, 130.
Moffat, J. A., articles by, 37, 264.
Monohammus confusor, 195.
" scutellatus, 195.
Montreal Branch, annual meeting of, 119.
" " report of council, 146.
Moths, early stages of some, 43.
" geometrid, larvæ of, 235.
" N. Am., new species of, 213
" North American, 242, 254.
Mundt, A. H., article by, 39
Murray, William, article by, 120.
Mycetophagus flexuosus, 261.
" punctatus, 261.
Myrmelion abdominalis, 264.

Natural History Society of Illinois, 107.
Nature-printed butterflies, 1.
Nephopteryx Zimmermani, 59.
Nerice bidentata, 231.
Neumoegen, B , article by, 67.
Noctuidæ, new, 88, 152.
" N. Am. in the Zutraege, 84, 116.
" " synonymy of, 184.
" list of, 155.
Nolaphana *labeculâ*, *n. s.*, 217.

Obituary, 220.
Obnoxious insects, their destruction by yeast, 81.
Ochyria designata, larva of, 235.
Œdipoda carolina, 222.
" cœrulescens, 222.
" *obliterata*, *n. s.*, 221.
Ogygia imperita, 118.
Oncocnemis *cibalis*, *n. s.*, 244.
" *levis*, *n. s.*, 254.
" list of species, 255.
Onthophagus hecate, 262.
Orthoptera, notes on, 221.
Orthosia differta, 186.
" perpura, 186.
Ottawa Field Naturalists' Club, 159.
Oyster-shell bark louse, 196.

Packardia *Goodelli*, *n. s.*, 242.
Paectes pygmaea, 87.
Pamphila *hyssus*, *n. s.*, 224.
" *pottawattomie*, *n. s.*, 50.
" *ursa*, *n. s.*, 49.
Pangrapta decoralis, 87.
Papilio cresphontes, 120, 211, 212, 264.
" marcellus, 211, 264.
" philenor, 211, 264.
Parallelia bistriaris, 86.
Parorgyia Clintonii, larva of, 45.
Passalus cornutus, 173.
Peabody, S. H., article by, 119.
Pea-weevil, 194.
Penthe obliquata, 262 .
" pimelia, 262.
Perigea *albolabes*, *n. s.*, 216.
" *falsa*, *n. s.*, 215.
Pezotettix obesa, 75.
Phaeocyma lunifera, 87
Phoberia atomarius, 86.
" rufimago, 86.
Phoxopteris angulifasciana, 172.
" *loricana*, *n. s.*, 218.
Phryganid, great abundance of a, 108.
Pieris rapæ, 192, 195.
Plectodera scalator, 107.
Plum curculio, 194.
Polia *aedon*, *n. s.*, 154.
" diffusilis, 186.
" *epichysis*, *n. s.*, 219.
" Theodori, 219.
Polygrammate hebraeicum, 85.
Porphyrinia matutina, 118.
Prionus Hayesii, 148.
Prodoxus decipiens, 172, 263.
Pronuba yuccasella, 128, 263.
Psenocerus supernotatus, 5.
Pseudoglossa lubricalis, larva of, 44.
Pteromalus puparum, 193.
Pterophoridæ of California, &c., 239.
Ptichodis bistrigata, 87.
Pyrameis cardui, 18, 136.
" huntera, 19.

Racheospila *cupedinaria*, *n. s* , 218.
Red spider, 237.
Report, annual, Ent. Soc. Ont., 76.
Riley, C. V., article by, 263.
Robin, food of, 191.
Rogers, R V., articles by, 61, 148.
Rose-bug, 196.

Salia interpuncta, 220.
Samia ceanothi, 227
" Gloveri, 227.
" promethea, 213.
SANBORN, FRANCIS G., article by, 66.
Satyrus alope, 21, 51, 91, 109.
" ariane, 90.
" baroni, 91.
" boopis, 54, 109.
" certain species of, 21, 51, 90, 109.
" charon, 94.
" Gabbii, 92.
" maritima, 23, 109.
" Meadii, 94, 109.
" nephele, 21, 53, 91, 109.
" olympus, 109, 140.
" paulus, 54.
" pegala, 51, 109.
" phocus, 94.
" silvestris, 54, 93, 109.
" sthenele, 92, 109.
" Wheeleri, 92.
" the genus catalogued, 115.
SAUNDERS, W., articles by, 4, 56, 159, 160, 189, 210, 237, 262.
Scepsis fulvicollis, larva of, 44.
Schinia gracilenta, 84.
" media, 185.
" trifasciata, 85.
Schœnobius macrinellus, 15.
SCUDDER, S. H., articles by, 75, 140, 161.
Septis mucens, 117.
SIEWERS, C. G., article by, 138.
Sirex gigas, 96.
Spermophagus robiniæ, 139.
Sphenophorus 13-punctatus, 107
Sphinx quinquemaculata, 101.
Spider, geometrical, 173.
Spilosoma virginica, 20, 56.
SPRAGUE, F. H., article by, 100.
Spruce, black, enemy of, 121.
State Entomologist for New York, 160.

Taeniocampa confluens, 187.
Tarache ardoris, 118.
" candefacta, 118.
" obatra, 187.
" patula, 58.
" *sutrix*, *n. s.*, 54.
Telea polyphemus, 212.
Tetranychus telarius, 237.
Thalpochares, described N. A. species of, 57.
" aetheria, 59.
" patruelis, 57.
THAXTER, R., article by, 39.
THOMAS, CYRUS, article by, 221.
Thyreus Abbotii, 211.
Tiger beetles, 61.
Tineina, new N. Am., 225.
Tomato worm, 101.
Tortricidæ, classification of, 171.
Toxotus cylindricollis, 107.
Tremex columba, 99.
Triaena tritoma, 87.
Triplax thoracica, 262.
Trochilium *lustrans*, *n. s.*, 213.
Tyroglyphus siro, 239.

Urocerus albicornis, 97.

WAILLY, ALFRED, article by, 227.
White scale of the orange, 252.
WILLET, J E., article by, 40.
Wood-eaters, on some, 95.
WORTHINGTON, C. E., article by, 46.

Xestia chlorapha, 86.
Xylomiges *dolosa*, *n. s.*, 88.
Xyloryctes satyrus, 139.

Zale horrida, 85.
Zutraege, N. Am. Noctuidæ in the, 84, 116.

a 301

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